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AUTHOR Jaeger, Richard M.; Busch, John Christian
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ABSTRACT

Beginning in the 1980-81 school year, the Pitt County (North Carolina) School System assigned students in kindergarten through grade 12 to subjects, teachers, and classes in accordance with a plan submitted to and approved by the United States Office for Civil Rights (OCR). This report gives results of an evaluation of the basic skills achievement effects of the assignment of students to ability groups for grades 2 through 8 in 1981-82 and 1982-83. Several assignment procedures were used, including ability grouping; all had been judged to be non-discriminatory. Achievement tests used were approved by the OCR. Each grade contained between 700 and 1,000 students. The principal analyses used data contained in 216 constructed files. Overall, ability grouping neither facilitated nor impeded the average achievement growth of students. When students were tracked longitudinally across the 2 years, ability grouping appeared to be inhibiting for students whose assignment in the second year was to a group lower than that in the first year, and it appeared to be facilitative for those assigned to a higher instructional group in the second year. Ability grouping appeared facilitative for white students and neutral for black students. Ability grouping was also most likely to be facilitative for students assigned to lowest-level instructional groups. Eight tables present study data. Forty-eight tables are appended, which present the results by race and stratum. (SLD)

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AN EVALUATION OF THE EFFECTS OF ABILITY GROUPING ON THE ACHIEVEMENT OF STUDENTS IN THE PITT COUNTY, NORTH CAROLINA PUBLIC SCHOOLS

by

Richard M. Jaeger and John Christian Busch

Center for Educational Research and Evaluation
University of North Carolina at Greensboro

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HIGHLIGHTS

* Students assigned to ability groups or teaching groups during the 1981-82 school year and the 1982-83 school year appear to have progressed in median achievement at the same rate as they would have exhibited, had they been randomly assigned to heterogeneous classes. Overall, ability grouping neither facilitated nor inhibited these students' average achievement growth.

* Students assigned to the highest-level ability or teaching groups during the 1981-82 school year appear to have progressed in median achievement at the same rate as they would have exhibited, had they been randomly assigned to heterogeneous classes. However, students assigned to these ability or teaching groups during the 1982-83 school year appear to have progressed in median achievement at a significantly lower rate than their expected rate, had they been randomly assigned to heterogeneous classes.

* Students assigned to middle-level ability or teaching groups during the 1981-82 school year appear to have progressed in median achievement at a rate that exceeded their expected rate of progress, had they been randomly assigned to heterogeneous classes. However, students assigned to these ability or teaching groups during the 1982-83 school year appear to have progressed in median achievement at the same rate as they would have exhibited, had they been randomly assigned to heterogeneous classes.

* Students assigned to the lowest-level ability or teaching groups during the 1981-82 school year and the 1982-83 school year appear to have progressed in median achievement at a rate that exceeded their expected rate of progress, had they been randomly assigned to heterogeneous classes.

* During the 1981-82 school year, ability grouping appears to have been facilitative for white students; their rate of median achievement growth was larger than the amount expected, had they been randomly assigned to heterogeneous classes. During the 1982-83 school year, ability grouping appears to have been neither facilitative nor inhibiting for white students; they appear to have progressed in median achievement at the same rate as they would have exhibited, had they been randomly assigned to heterogeneous classes.

* During the 1981-82 school year and during the 1982-83 school year, ability grouping appears to have been neither facilitative nor inhibiting for black students; black students appear to have progressed in median achievement at the same rate as they would have exhibited, had they been randomly assigned to heterogeneous classes.

* During the 1981-82 school year and the 1982-83 school year, ability grouping appeared to be significantly facilitative for students assigned to the lowest-level instructional groups.

* During the 1981-82 school year, ability grouping was significantly facilitative for students assigned to middle-level instructional groups. It was neither facilitative nor inhibiting for students assigned to middle-level instructional groups during the 1982-83 school year.

* During the 1981-82 school year, ability grouping was neither significantly facilitative nor inhibiting for students assigned to the highest-level instructional groups. Ability grouping was significantly inhibiting for students assigned to the highest-level instructonal groups during the 1982-83 school year.

* When students' median achievement test performance was tracked longitudinally across two school years, ability grouping did not appear to have a significant overall effect. Their median achievement progressed at a rate that was about the same as would be expected, had they been randomly assigned to heterogeneous classes.

* When students' median achievement test performance was tracked longitudinally across two school years, (1) ability grouping did not appear to affect the performance of students assigned to the same level of instructional group in both years, (2) it appeared to be inhibiting for students whose assignment in the second year was to a lower instructional group than in the first year, and (3) it appeared to be facilitative for students whose assignment in the second year was to a higher instructional group than in the first year.

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To each of these persons, we express our heartfelt thanks. They bear much responsibility for whatever good may be contained in this report, and none of the blame for residual errors.

I. Introduction and Background

Beginning during the (1980-81) school year, and for the following two school years, the Pitt County School System assigned students in kindergarten through grade 12 to subjects, teachers and classes in accordance with a plan submitted to and approved by the Office for Civil Rights of the (then) Department of Health, Education and Welfare (now Department of Education). The essential elements of that plan are specified in a letter of agreement dated April 25, 1980, from William H. Thomas, Director, Office for Civil Rights (Region IV) to the late Arthur S. Alford, then Superintendent of the Pitt County School System.

One feature of the approved plan for compliance was that its effects be evaluated annually over the full span of its implementation. This document contains a report describing the results of an evaluation of the basic skills achievement effects of the approved student assignment procedures, specifically as they are evidenced by students in Grades 2 through 8.

Under the approved plan, kindergarten students were assigned to classes on a random heterogeneous basis. That is, students were stratified by gender and race, listed alphabetically within their respective strata, and then assigned to classes through proportional allocation until the strata were depleted.

Since this method of assignment ensures that each kindergarten class was representative of the racial and gender distribution of kindergarten students throughout the Pitt County School System, and because the compliance plan does not specify the assignment of kindergarten students to teaching groups once

they have been assigned to classes, there is no possibility that kindergarten students of any race or sex could be disadvantaged by virtue of their assignment. Therefore, there was no need for special evaluation of achievement effects resulting from the assignment of students to kindergarten classes.

For students in grades one through three, schools had the option of assigning students to classes in one of three ways. At least one elementary school in the Pitt County System has selected each of the three options for assignment of students to classes at each of these grade levels.

Four schools elected to assign first-grade students to classes in accordance with a random heterogeneous plan. Under this assignment method, students were assigned to classes in the manner described above for kindergarten students. However, once students have been assigned to classes, teachers form three teaching groups in reading and three teaching groups in mathematics, using valid reliable, nondiscriminatory test instruments for initial assignment of students to the groups.

Two schools elected to assign grade-two and grade-three students to classes using the random heterogeneous plan, again using appropriate nondiscriminatory achievement measures for initial assignment of students to teaching groups once they have been assigned to classes.

Four schools elected to assign grade-one students to classes in accordance with a stratified heterogeneous grouping assignment plan. In this assignment method, all students within a grade were placed in one of three achievement strata in reading and one of three achievement strata in mathematics on the basis of their

performance on valid, reliable, nondiscriminatory achievement tests. Students were then assigned to classes through random, proportional allocation from achievement strata, until desired class sizes were achieved or strata had been depleted. Once assigned to classes, students were assigned to one of three teaching groups in reading and one of three teaching groups in mathematics, on the basis of their initial assignment to strata.

Six schools assigned grade-two and grade-three students to classes using a stratified-heterogenous plan that incorporated initial assignment to teaching groups on the basis of the students' performances on valid, reliable, nondiscriminatory achievement tests.

The third option available for assignment of students in grades one through three to mathematics and reading classes was bonafide homogeneous grouping. Under this plan, students were assigned to one of three achievement strata in reading and one of three achievement strata in mathematics on the basis of their performances on valid, reliable, nondiscriminatory achievement measures in these subjects. Following their allocation to achievement strata, students were assigned to classes in reading and mathematics by first arranging them alphabetically within strata, and then proceeding through the stratum lists, from high to low, until desired class sizes had been achieved or strata had been depleted. For the remainder of the school day, students were assigned to classes on the basis of random heterogeneous grouping, as described above for kindergarten students.

Three Pitt County schools elected to assign grade-one,

grade-two and grade-three students to reading and mathematics classes using a bonafide homogeneous grouping plan.

For students in grades four through eight, the Pitt County School System employed a combination of two previously-described methods of assignment. A bonafide homogeneous grouping plan was be used to assign students to classes in language arts, mathematics, science, and social studies. Again, appropriate nondiscriminatory assessment devices having demonstrably adequate psychometric qualities, including reliability and validity, were used for initial assignment of students to achievement strata in these areas. For all other subjects, students were assigned to classes using the random heterogeneous grouping method described above for kindergarten students.

For students in grades nine through twelve, the Pitt County School System has adopted a system of completely open enrollment in any course offered, through informed choice of students and their parents. Students in these grades are therefore not subject to any form of ability grouping or administratively-determined assignment to courses or teaching groups within courses. As is the case for kindergarten students, no special evaluation of the achievement effects of this assignment plan would appear to be warranted since students in grades nine through twelve could not be adversely affected by a class or group assignment procedure.

Restricting the focus of this evaluation plan to students in grades two through eight was thus considered to be appropriate in view of the clearly nondiscriminatory assignment procedures adopted by the Pitt County School System for kindergarten and

first-grade students and for students in grades nine through twelve.

The effects of homogeneous grouping on the achievement of elementary and secondary students has been the subject of a large number of research and evaluation studies. In addition, other research has focused on the relationships between ability grouping and students' motivation and attitude toward school. The results of these studies have been mixed, with some evaluators and researchers finding evidence that supports the use of homogeneous grouping and others finding contradictory evidence.

In previous administrative plans and research studies, students have been grouped on the basis of age (Mobley, 1976), intelligence test scores (Piland, 1971; Williams, 1973; Abramson, 1959), and achievement test performance (Barlow, 1962; Berkum, 1966; Johnson, 1967; Douglas, 1971). Wardrop (1976) used a combination of achievement test performance and intelligence test scores to assign students to groups, while Breidenstein (1936) grouped students on the basis of achievement test scores, intelligence test performance, and teachers' recommendations. Thus the assignment bases utilized by the Pitt County School System--initial assignment of students using nondiscriminatory achievement measures, and subsequent assignment on the basis of a combination of nondiscriminatory achievement measures and teacher-assigned course grades--are totally consistent with the practices adopted by other administrative units and educational researchers over the last four decades.

II. Evaluation Questions to be Answered

This evaluation focused on securing answers to a prescribed set of questions concerned with the achievement progress of various groups of students. Consistent with Office for Civil Rights guidelines, standardized, objective, nondiscriminatory achievement tests were used to secure data on the impact of the various student assignment methods employed by the Pitt County School System.

For students in grades two and three, answers to the following questions were sought:

1. Do students assigned to each level of ability group or teaching group demonstrate progress in tested achievement that is at least as great as they would have exhibited, had they been randomly assigned to heterogeneous classes within their grade?
2. What is the comparative effect of assignment to ability groups or teaching groups, for black students and white students?
3. What is the comparative effect of assignment to ability groups or teaching groups, for students assigned to different levels of teaching or ability groups (i.e., low, medium, high)?

For students in grades four through eight, essentially the same questions were examined. However, the only method of assignment examined for students in these grades was bonafide homogeneous grouping, in the subject areas language arts, mathematics, science, and social studies.

III. Collection and Storage of Data

A. Student-based Logical Records

Data used in the evaluative analysis were assembled in a master file, with a logical record defined for each student enrolled in the Pitt County schools in grades two through eight during the 1980-81 school year. Logical records were added for students who transferred to, or were newly enrolled in the Pitt County School System in grades two through eight during the 1981-82 school year and the 1982-83 school years.

Data were added to each record following the conclusion of the school year and after data tapes were received by the school system from the test publishers or State Department of Education and then forwarded to the consultants.

One feature unique of this evaluation is the fact that cumulative multi-year records were created for students in grades two through eight during the school years 1981-82 and 1982-83. This permited longitudinal analyses of the effects of students' assignments over two years and allowed the incorporation of data from a number of successive test administrations. It resulted in the creation of a very large SPSS system file of over 12,000 blocks.

B. Data Collected In the Evaluation

In addition to the achievement test data described below, each student's logical record contained the following information:

1. School unit in which each child was enrolled; this was based on a unique I.D. number assigned to each child. This

allowed identification of the method used to assign the student to instruction in selected subject areas:

a. For students in grades two and three--reading and mathematics.

b. For students in grades four through eight--language arts, mathematics, science, and social studies.

2. Levels of teaching groups or ability groups to which student was assigned, for the subject areas listed in 1., above. These data were recorded for the student assignment in each subject area during each of three school years. Assignment coding followed the operational rules specified on pages 11 and 12 of this report. Three strata levels were possible.

3. Student's race and sex.

C. Standardized Achievement Test Data

The standardized achievement tests that were administered in conjunction with the Pitt County School System's Title VI compliance procedures are well described in the plan approved by the Office for Civil Rights. The tests, levels, and forms to be used are listed here merely for completeness. All tests were administered at the end of the school year (Spring).

Grade Level	Test	Level	Form	Scores Produced
1	Prescriptive Reading Inventory	II		Reading
1	Diagnostic Mathematics Inventory	A	Red	Mathematics
2	Prescriptive Reading Inventory	A		Reading

2	Diagnostic Mathematics Inventory	B	Green	Mathematics
3	California Achievment Test	13	C	Language Arts, Mathematics
3	Comprehensive Tests of Basic Skills	1	S	Science, Social Studies
4	California Achievement Test	14	C	Language Arts, Mathematics
4	Comprehensive Tests of Basic Skills	1	S	Science, Social Studies
5	California Achievement Test	15	C	Language Arts, Mathematics
5	Comprehensive Tests of Basic Skills	2	S	Science, Social Studies
6	California Achievement Test	16	C	Language Arts, Mathematics
6	Comprehensive Tests of Basic Skills	2	S	Science, Social Studies
7	California Achievement Test	17	C	Language Arts, Mathematics
7	Comprehensive Tests of Basic Skills	3	S	Science, Social Studies
8	California Achievement Test	18	C	Language Arts, Mathematics
8	Comprehensive Tests of Basic Skills	3	S	Science, Social Studies

A complete file of each student's test performance was maintained during the three years of the evaluation by adding scores to all logical records following each test administration. Thus students who were enrolled in grades two through six during the 1980-81 school year and continued to be enrolled in the Pitt County schools for the full duration of the evaluation had three sets of test scores in their files for use in the evaluative

analysis. Students enrolled in grade seven during the 1981-82 school year who maintained their enrollment in the Pitt County schools during the remainder of the evaluation, and who progressed through the grades at a normal rate, had two sets of test scores in their files for use in evaluative analysis. One set of test scores was obtained for students who were enrolled in grade eight during the 1981-82 school year and who progressed to grade nine at the beginning of the 1982-83 school year.

IV. Analysis of Data and Reporting of Results

A. Construction of Data Files

The principal analyses made use of data contained in a total of 216 constructed files. In the basic file structure, students were sorted by grade level, race, ability group or teaching group, and subject area tested. One set of 72 files was constructed for black students; a parallel set of 72 files was constructed for white students; and a third set of 72 files was constructed for all students, regardless of race. Each grade level x test x ability level combination was included in each set of files. It is our judgement that the evaluation questions specified above can be answered with the 216 files. For each year of the evaluation and each subject area tested in grades two through eight, the basic file structure is illustrated below for black students.

Data Files for Black Students

Ability Group or Teaching Group

Grade:	Low	Middle	High
2			
3			
4			
5			
6			
7			
8			

With parallel data files for white students and for all students, regardless of race, it was possible to address each of the evaluation questions defined above using a procedure that is psychometrically sound and comparatively robust. Details of the analysis are discussed below.

In constructing a data file, records for all students were first sorted by race. The entire file for students of a given race was then sorted by grade level. Sorting by ability group or teaching group for each tested subject area required the application of a set of operational rules as follows:

1. Students in grades two and three who were assigned to a teaching group through random heterogeneous procedure or a stratified heterogeneous procedure, or who were assigned to an ability group through a bonafide homogeneous grouping plan, and who remained in their initially assigned group for the duration of the school

year, had their test performances recorded in the file for their initially assigned grouping level (low, middle, or high).

2. Students in grades four through eight who were assigned to an ability group through a bonafide homogeneous grouping plan, and who remained in that group for the duration of the school year, had their test performances recorded in the file for their initially assigned grouping level (low, middle, or high).

3. Students in grades two and three who were assigned to a teaching group through a random heterogeneous procedure or a stratified heterogeneous procedure, or who were assigned to an ability group through a bonafide homogeneous grouping plan, and who were reassigned to another teaching group or ability group at the beginning of one or more report card periods during the school year, had their test performances recorded in the file for the grouping level to which they have been assigned for the majority of the school year. In the case of students who had been assigned to two or more grouping levels for equal portions of the school year, test performance was recorded in the file for the most recent grouping level to which students had been reassigned.

4. Students in grades four through eight who were assigned to an ability group through a bonafide homogeneous grouping plan, and who were reassigned to another ability group at the beginning of one or more report

card periods during the school year, had their test performances recorded in the file for the grouping level to which they had been assigned for the majority of the school year. In the case of students who had been assigned to two or more grouping levels for equal portions of the school year, test performances were recorded in the file for the most recent grouping level to which students had been reassigned.

B. Process of Editing and Preparation of Data Files

Pitt County Schools provided us with three tapes containing data (a North Carolina State Department of Education tape, a CTBS tape, and a CAT tape) for each of the three project years; the final tapes received were for the 1982-83 school year. We have tried to be as systematic and precise as possible in working with this very large data set--approximately 8,000-9,000 cases (with many data points for each year). Since only a small portion of the data on the original source tapes were to be utilized, each tape was read and pertinent data were extracted. These files were printed and then inspected individually. Frequency distributions were run, and after identifying "dirty", out-of range or "missing" data, the lists were returned to Pitt County for editing and updating. When these lists were returned to us, corrections were individually edited into the data base. Other work which had to be accomplished "by hand" was the entry of any stratum changes occurring during the school year for children in each of the subject areas, as well as adding missing identification numbers. In most cases, the process required communication

with the Pitt County Central Schools' centeral office, with the individual schools, and then back to us. That extremely time-consuming work was completed for each of the three years of data. We made additional checks, and where necessary additional updated information was secured from the Pitt County Schools. The Pitt County School System was extremely helpful in this process and demonstrated a real committment that all data be supplied and analyzed correctly.

The next step in the evaluation consisted of merging three data sources for each year (State, CTBS, CAT) into individual student records for a single year. Following that, data for the three years were merged into unitary records so that comparisons across years could be made.

We felt that it was absolutely essential that we check the accuracy of all data to the extent that was reasonably possible. Because of human or machine error, relatively infrequent inaccuracies continued to be present in the data base and therefore late in the Fall 1983, we developed a computer program which checked the consistency of certain demographic information from year to year and from one tape source to another. We then produced a list of cases in which the sex, race, or ID of students, did not match; we then worked with the Pitt County Schools to resolve and correct these inconsistencies. While the file will never be totally error-free, we feel that we have made every reasonable effort to approach that ideal.

C. Method of Analysis

A complete review of the ERIC data base using the descriptors "methodology," "ability grouping," and "evaluation," revealed that the predominant analytic method used in research on the effects of ability grouping, or the evaluation of ability-grouping projects, was analysis of variance (Abramson, 1959; Berkum, 1966; Borg, 1976; Johnson, 1967; Piland, 1971; Thompson, 1976; Wardrop, 1976; Williams, 1973). Mobley (1976), Douglas (1971), and Barlow (1962) used tests based on Student's t-statistic to examine hypotheses on the achievement effects of grouping.

Since both analysis of variance and t-tests presume that the samples being compared were randomly assigned to treatment and, perhaps, control groups, the predominant methodology was not applicable in the Pitt County School System. Pitt County's plan for Title VI compliance required the purposeful assignment of most students to instructional groups, be they ability groups or teaching groups, so that random comparability of instructional groups at the beginning of the school year could not be assumed. It was therefore necessary to reference a larger normative population when estimating the achievement progress Pitt County students would have realized, had they not been purposefully assigned to instructional groups.

Overview of Contrasts for Analysis of Data. Three sets of contrasts were made using longitudinal data at three points. Each set of contrasts compared data obtained from different school years for the same subjects. The first contrast, labeled "A",

compared data collected in Year 2 (1982) with data collected for the same subjects' in year 1 (1981). The second contrast labeled "B", compared data collected in Year 3 (1983) with data collected for the same students in year 2 (1982). The third contrast labeled "C", consisted of comparisons based on different sequences of stratum assignments across the three years of the evaluation.

These contrasts were based only on complete data sets, including all requisite achievement data as well as complete data for all variables such as grade, race, and strata level. Cases for which there were missing data were excluded. This reduced the total number of cases in the data base to some degree (See Table 1 below).

Specific Method of Analysis. The methodology used in answering each question will be illustrated for students in one of the files listed in the schematic diagram above--say black students in grade 2 who are placed in a low-ability reading group as a result of a bonafide homogeneous grouping plan, or in the lowest-level teaching group in reading, as a result of a random heterogeneous assignment procedure or a stratified heterogeneous assignment procedure. This file may be noted in the second row of the first column of the schematic diagram. Each of the second-grade students in Pitt County who completed the first grade in Pitt county schools during the 1980-81 school year completed Level II of the Prescriptive Reading Inventory. In addition, students who completed the second grade in the Pitt County schools during the 1981-82 school year were administered Level A of the Prescriptive Reading Inventory at the end of grade

two. Thus most black students in the low ability or teaching group file during grade two provided performance data on these two tests. These data were analyzed as follows:

1. The cumulative distribution function of equated scaled scores of black second-grade students assigned to low ability or teaching groups was constructed for Level II of the Prescriptive Reading Inventory, using equated scores on the California Achievement Tests, as provided by CTB-McGraw Hill.

2. The twenty-fifth, fiftieth, and seventy-fifth percentiles (P_{25}, P_{50}, and P_{75}) of this distribution were computed.

3. Using the simulated national norm distribution of scores on Level II of the Prescriptive Reading Inventory, as developed by CTB-McGraw Hill, national percentile ranks corresponding to P_{50} were determined.

4. The culmulative distribution function of equated scaled scores of black second-graders assigned to low ability or teaching groups was constructed for Level A of the Prescriptive Reading Inventory, using equated scores on the Califonia Achievement Tests, as provided by CTB-McGraw Hill.

5. The twenty-fifth, fiftieth, and seventy-fifth percentiles (P_{25}, P_{50}, and P_{75}) of this distribution were computed.

6. Using the simulated national norm distribution of scores on Level A of the Prescriptive Reading Inventory, as developed by CTB-McGraw Hill, national percentile ranks corresponding to P_{50} were determined.

7. Differences in corresponding simulated national percentile ranks for Level A and Level III of the Prescriptive Reading

Inventory associated with P_{50} of the cumulative distribution functions of scores of black second-graders in Pitt County Schools who are assigned to low ability or teaching groups were calculated.

8. Those differences were reported, and in addition, were compared to a threshold value of reliable differences, determined from the standard errors of measurement of the two tests, as follows:

a. The standard error of measurement of equated individual scaled scores on Level II of the Prescriptive Reading Inventory was secured from CTB-McGraw Hill;

b. The standard error of measurement of equated individual scaled scores on Level A of the Prescriptive Reading Inventory was secured from CTB-McGraw Hill;

c. The standard error of measurement of the median of each score distribution was determined through the relationship:

$$(sem)_{Md} = 1.57\ [sem^2/n]^{1/2},$$

where sem denotes the standard error of measurement of individual raw scores, and n denotes the number of scores in the distribution;

d. The standard error of measurement of the difference between the medians (Md1 and Md2) of the two distributions was determined through the relationship:

$$(sem)Md_{diff} = [(sem)^2_{Md1} + (sem)^2_{Md2}]^{1/2};$$

e. A simulated equated scaled score on Level II of the Prescriptive Reading Inventory, equal to the median of the distribution of equated scaled scores plus two times (sem) Md_{diff}, was calculated. This score was denoted "Md+";

f. The percentile rank in the simulated national norm distribution of scores on Level II of the Prescriptive Reading Inventory corresponding to Md+ was determined,

g. The percentile rank difference in the simulated national norm distribution of scores on Level II of the Prescriptive Reading Inventory, between percentile ranks corresponding to Md+ and the median, was calculated. This difference was denoted "Rel Diff";

h. The threshold value used to identify a reliable difference between percentile ranks corresponding to medians in the distributions of equated scaled scores on Levels II and A of the Prescriptive Reading Inventory was the smaller of (i) two percentile ranks, or (ii) Rel Diff. (Note that a threshold smaller than two percentile ranks cannot be used because there is a one-unit margin of error in assigning each local median to a percentile rank in its corresponding national norm distribution.)

9. When the difference between the simulated national percentile ranks for Levels A and II of the Prescriptive Reading Inventory, corresponding to the fiftieth percentiles of the distributions of scores of black second-graders assigned to low ability or teaching groups, was compared with the threshold value of reliable differences as determined through the procedure described above, the differences were classified in one of three ways:

a. As a positive difference, provided the simulated national percentile rank on Level A exceeded the simulated

national percentile rank on Level II by at least the threshold value;

b. As a negative difference, provided the simulated national percentile rank on Level A was exceeded by the simulated national percentile rank on Level II by at least the threshold value;

c. As insignificant, provided neither of the conditions listed in a. and b., above, were realized.

The analytic procedure described above for the file of black second-graders who were assigned to a low ability or teaching group was completed for each of the 72 files constructed for black students as well for the 72 data files constructed for white students and the 72 data files constructed for all students, regardless of race.

To answer the first of the evaluation questions listed in Section II: "Do students assigned to each level of ability grouping or teaching group demonstrate progress in tested achievement that is at least as great as they would have exhibited, had they been randomly assigned to heterogeneous classes within their grade?" the results of analysis of data in the 72 files constructed for all students were tabulated as follows:

Number of files excluded because n<10: ____

Number of files producing a positive difference: ____

Number of files producing an insignificant difference: ____

Number of files producing a negative difference: ____

Since the students whose data constitute each of the 72 files were assigned to grade levels and ability or teaching

groups independently, the data on differences can be treated as 72 independent observations from a binominal distribution. The statistical significance of progress in tested achievement (either a "gain" in median achievement levels that exceeds maintenance of the same relative position in national norm distributions, or a "loss" in median achievement levels beyond maintenance of the same relative position in national norm distributions) was tested using the Sign Test (Siegel, 1956, p. 68ff).

Since data from the entire population of Pitt County school children in grades 1 through 8 were being analyzed, the meaning of "statistical significance" must be examined carefully. Certainly, there can be no formal inference to the performance of a population of interest. One may ask, however, whether the performance of this population is so extreme, either in terms of achievement gain or achievement loss, that it would be unreasonable to maintain the belief that, in some theoretical "superpopulation" from which this population had been sampled, there is no relationship between purposeful assignment of students to ability groups or teaching groups and achievement progress.

The general method of analysis described above was applied separately to the 24 data files (see Note 1) constructed for students assigned to low ability or teaching groups, to the 24 data files constructed for students assigned to middle ability or teaching groups, and to the 24 data files constructed for students assigned to high ability or teaching groups. The

results of these three analyses, coupled with the analysis of data in all 72 files, provided a definitive answer to the first of the evaluation questions.

The second evaluation question listed in Section II: "What is the comparative effect of assignment to ability groups or teaching groups, for black students and white students?" was treated in much the same way as the first evaluation question. Here, the method of analysis described above was applied separately to the 72 data files constructed for black students and to the 72 data files constructed for white students.

There are nine possible comparative outcomes. Three would support the conclusion that purposeful assignment to ability groups or teaching groups is more effective for black students than for white students, three would support the opposite conclusion, and three would support the conclusion that there is no difference between the effectiveness of purposeful assignment to ability groups or teaching groups for white students or black students. The conclusion that purposeful assignment is more effective for black students than for white students would be reached under any of the following three conditions:

1. The results of analysis suggest that black students have realized a statistically significant "gain" in median achievement levels, and that white students have progressed by an amount that is not significantly different from normally expected progress;

2. The results of analysis suggest that black students have realized a statistically significant "gain" in median achievement levels, and that white students have realized a statistically

significant "loss" in median achievement levels;

3. The results of analysis suggest that black students have progressed by an amount that is not significantly different from normally expected progress, and that white students have realized a statistically significant "loss" in median achievement levels.

The conclusion that purposeful assignment is more effective for white students than for black students would be reached under conditions identical to those listed above, except that the words "black students" and "white students" would be reversed in each statement.

The conclusion that purposeful assignment to ability groups or teaching groups is equally effective for black students and white students would be reached under any of the following three conditions:

1. The results of analysis suggest that both black students and white students have realized statistically significant "gains" in median achievement levels;

2. The results of analysis suggest that both black students and white students have progressed by an amount that is not significantly different from normally expected progress;

3. The results of analysis suggest that both black students and white students have realized statistically significant "losses" in median achievement levels.

The third evaluation question listed in Section II: "What is the comparative effect of assignment to ability groups or teaching groups, for students assigned to different levels of teaching groups or ability groups (i.e., low, medium, high)?,"

was addressed by conducting analyses similar to those described above for the first two evaluation questions. Results developed for the three sets of 24 data files used in responding to the first evaluation question were compared to determine whether students assigned to any of the three levels of ability or teaching groups exhibited achievement progress that was significantly greater than that exhibited by students assigned to other grouping levels. The types of comparisons enumerated above for black students and white students, were conducted for students assigned to low, medium, and high ability or teaching groups. The procedures described above were used in carrying-out contrasts A and B.

The basic analytic procedures used for Contrast C were essentially similar to those used for Contrasts A and B. By constructing longitudinal data records for individual students, it was possible to trace their history of assignment to teaching groups or ability groups as well as their history of performance on achievement tests. Using students' group assignment histories, data files similar to those described above were constructed for students who had been in various grade spans (such as one through three) and who had experienced various sequences of group assignments (such as lowest-level reading groups in grade two and a middle-level reading groups in grade three). In reviewing students' group assignment histories at the end of the second and third years of the evaluation, nine basic patterns were found. The sequences are described in detail in Section V, below. Several of the sequences were found to occur relatively infrequently, and it was decided to eliminate any

files which had less than ten cases, since statistics based on such small samples would be unreliable. The achievement progress of groups of students was compared to their expected achievement, had they not been assigned to teaching groups or ability groups, by referencing appropriate national norm distributions of the tests used with their grade spans during the course of the evaluation. The specific analyses conducted with these data were virtually identical to those described above . Elaboration of those procedures would therefore be redundant.

V. Status of Data Base

In this section we describe the three-year longitudinal data base. First, we compare the number of individuals present at each grade-level of the data base with the number of individuals enrolled in the school system during the three-year period. These data illustrate the completeness of the data base. In Part B we provide descriptive information for each of the three points in the longitudinal data base; we describe the distribution of student records for each stratum level within each grade level, for students of each race. This section provides information for all records present in the data base. In contrast, analyses of data for Contrasts A, B, and C described above, required that only complete data records be used. Part C describes the data base for these individual contrasts, with particular attention to determining whether this data base was representative.

A. Comparison of Data Base to School Enrollment

The Pitt County School system was requested to provide ninth-month enrollment reports for each of grades one through eight during the school years: 1980-81, 1981-82, 1982-83. These data were used as a check to verify that the data base used for the evaluation contained data for a reasonable proportion of the students actually enrolled during each of these school years. Table 1 reports the number of children enrolled in each grade, as specified by the Pitt County School System. Numbers in parentheses in the same table denote the total number of students included in our three-year data file for each grade for each year. It should be noted that system-wide achievement testing in each school year took place several months prior to the ninth school month. Therefore, some children who were present at the time of testing may have moved from the school system by May. It appears that the numbers of students in our data set and the numbers of students expected, based on School Census data, are very close. We therefore feel confident that the data base is representative of the total population of the school system.

It should be noted that the numbers reported in Table 1 represent all cases in the data base for whom we have a record, whether or not the record was complete. There are instances in this data base in which one or more bits of information are missing. Section C (below) reports the number of cases for which there are no missing data (i.e., cases that were actually included in the analysis).

Table 1

Actual School Enrollment and Number of Cases in Data Base by Grade and Y

Grade	1980-1981		1981-1982		1982-1983	
1	953+	(947)*	949	(936)	907	(887)
2	861	(852)	935	(924)	892	(875)
3	900	(900)	878	(822)	871	(846)
4	973	(988)	876	(854)	880	(859)
5	837	(893)	962	(960)	839	(816)
6	837	(835)	853	(852)	952	(926)
7	851	(855)	866	(868)	872	(842)
8	883	(872)	807	(816)	842	(828)

+Number of Children Enrolled.
*Number of Children in Data Base.

B. Description of Data in Each Year of Longitudinal File

In order to fully describe the longitudinal data base, we have reported the number of individuals at each stratum level for each grade and for both races. Summaries are provided for each of the four tests during each of the three years: 1980-81 (Table 2), 1981-82 (Table 3), 1982-83 (Table 4). Some appreciation of the total number of individuals in the data base at each grade level can be obtained through inspection of these tables. The reader should note that the total reported for each grade level and stratum include missing cases, therefore the row and column totals do not sum to these totals.

Table 2

Summary Characteristics for 1981 Data Base: Number of Students at Grade and Race by Stratum Level

Reading/Language Arts Stratum Level

Grade	1	2	3	Total*
1	501	340	101	944
2	468	306	75	850
3	440	344	102	886
4	436	413	115	964
5	331	378	121	829
6	365	358	104	828
7	333	359	152	844
8	313	388	166	867
Total	3186	2886	937	7012

Math Stratum Level

Grade	1	2	3	Total*
1	462	353	126	943
2	607	186	53	847
3	493	297	93	884
4	413	417	134	964
5	339	366	124	829
6	349	344	134	828
7	299	390	156	844
8	315	377	176	868
Total	3277	2730	996	7008

Science Stratum Level

Grade	1	2	3	Total
3	113	78	20	278
4	428	417	123	968
5	324	381	127	832
6	349	352	123	824
7	343	371	134	848
8	308	396	164	868
Total	1865	1995	691	4618

Table 2 (continued)

Social Studies Stratum Level

Grade	1	2	3	Total
3	119	74	14	271
4	465	362	143	970
5	341	336	146	823
6	288	382	154	824
7	330	348	170	848
8	323	388	157	868
Total	1866	1890	784	4605

Stratum	Race 1	2
Reading 1	2772	903
Reading 2	1097	1787
Reading 3	213	721
Mathematics 1	2239	1028
Mathematics 2	1107	1619
Mathematics 3	238	721
Science 1	1471	388
Science 2	792	1208
Science 3	150	541
Social Studies 1	1420	441
Social Studies 2	794	1095
Social Studies 3	194	590

*Includes missing values; does not total
Stratum: 1 = High, 2 = Medium, 3 = Low
Race: 1 = White, 2 = Black

Table 3

Summary Characteristics for 1982 Data Base: Number of Students at Grade and Race by Stratum Level

Reading Stratum Level

Grade	1	2	3	Total*
1	604	252	77	934
2	588	275	61	924
3	521	288	53	862
4	463	297	83	843
5	443	409	103	956
6	425	329	87	841
7	390	365	109	864
8	357	317	126	800
Total	3791	2532	699	7024

Math Stratum Level

Grade	1	2	3	Total*
1	600	246	87	934
2	737	160	27	924
3	650	165	47	862
4	481	267	96	844
5	415	429	112	956
6	437	321	82	840
7	366	383	112	861
8	361	320	119	800
Total	4047	2291	682	7021

Science Stratum Level

Grade	1	2	3	Total
3	149	64	16	330
4	467	276	97	845
5	453	398	100	951
6	394	355	95	844
7	397	335	125	857
8	346	341	112	800
Total	2206	1769	545	4627

Table 3 (continued)

Social Studies Stratum Level

Grade	1	2	3	Total
3	178	36	16	333
4	463	276	103	845
5	449	382	119	950
6	380	370	92	842
7	366	357	133	856
8	340	341	115	797
Total	2176	1762	578	4623

Stratum	Race 1	2
Reading 1	2539	1241
Reading 2	912	1616
Reading 3	153	545
Mathematics 1	2568	1466
Mathematics 2	882	1406
Mathematics 3	151	531
Science 1	1631	569
Science 2	651	1117
Science 3	124	421
Social Studies 1	1569	602
Social Studies 2	700	1061
Social Studies 3	136	441

*Includes missing values; does not total.
Stratum: 1 = High; 2 = Medium; 3 = Low
Race: 1 = White; 2 = Black

Table 4 (continued)

Social Studies Stratum Level

Grade	1	2	3	Total
3	35	7	4	111
4	526	239	92	861
5	446	298	72	816
6	413	384	134	931
7	417	342	86	844
8	379	350	97	826
Total	2216	1620	484	4389

Stratum	Race 1	Race 2
Reading 1	2169	1214
Reading 2	616	1267
Reading 3	110	324
Mathematics 1	2196	1409
Mathematics 2	612	1093
Mathematics 3	87	302
Science 1	1482	626
Science 2	545	951
Science 3	74	311
Social Studies 1	1455	626
Social Studies 2	571	941
Social Studies 3	107	325

*Includes missing values; does not total.
Stratum: 1 = High; 2 = Medium; 3 = Low
Race: 1 = White; 2 = Black

C. Description of Data Base Used in Contrasts--Complete Files

Section IV describes three different sets of analyses, termed Contrasts A, B, and C. These analyses were based only on subfiles with a sample size equal to or greater than 10, and only used cases for which both pretest and posttest data as well as grade strata, and race information were present. As a result, the numbers of cases used in these analyses were smaller than the total number of cases in the data base. This section of the report describes the data base actually used in completing Contrasts A, B, and C. A separate sub-section is provided for each contrast.

Description of Data Base for Contrast A: Table 5 reports the number and percentage of cases assigned to each of the three stratum levels for the Reading and Mathematics tests for grades one to three, and to each of the three stratum levels for the Language Arts, Mathematics, Science and Social Studies tests for grades four through eight, in Contrast A. Contrast A consists of cases which were followed longitudinally from pretesting at the conclusion of the 1980-81 school year, to posttesting at the conclusion of the 1981-82 school year. The stratum levels used were those for the 1981-82 school year. Numbers reported in Table 5 reflect cases for which we had complete data on the following variables: stratum level, grade, race, and both pretest and posttest achievement test measures. Because of this requirement, totals do not include cases for which there were incomplete data, either because a student failed to take one of the tests, or because the student moved from the district during the two-year period. Therefore we expected that the number of complete (with

no missing data) records would be smaller than the orginal number of records for a given grade during a given school year. The right-most column of Table 5, reports the total number of cases in the data base with complete records for each grade. Next to it (in parenthesis) is the percentage which that number represents, of the total number of students actually enrolled in the grade at the conclusion of the 1981-82 school year. From these data it is possible to gain information on the representativeness of the files used in the Contrast A analysis. In approximately forty-percent of the grade-test combinations, the percentages were greater than 90%; in 22 of 24 cases, the percentages were equal to, or were greater than 85%. Therefore, we conclude that the students actually enrolled during those two years were well represented in the data base which we planned to use.

It may also be seen that the great majority of students were assigned to the high and middle strata. This was especially true at the lower grade levels where, for example, only between one percent and five percent were assigned to stratum 3 (the lowest strata). As the students progressed through the grades, far more students tended to be placed in the lowest stratum, e.g., between nine percent and 16%. The relatively small incidence of lowest-stratum children suggests that inferences based on these small samples will tend to be rather unreliable. We have decided to exclude from the analysis any groups for which the sample size is smaller than 10.

Table 5

Number and Percentage of Students in Merged and Complete Records for Contrast A (1981-82): By Stratum

Grade	Subject	Number (%) of students in each strata: Stratum 1	Stratum 2	Stratum 3	Percent Enrolled in 1982: Total
2 v 1	RE	534 (65%)	246 (30%)	40 (05%)	820 (88%)
	MA	673 (65%)	134 (16%)	12 (01%)	819 (88%)
3 v 2	RE	460 (66%)	215 (30%)	26 (04%)	701 (80%)
	MA	579 (82%)	102 (15%)	22 (o3%)	703 (80%)
4 v 3	LA	421 (55%)	266 (35%)	73 (10%)	760 (87%)
	MA	444 (58%)	238 (31%)	80 (11%)	762 (87%)
	SC	421 (58%)	243 (32%)	88 (12%)	752 (86%)
	SS	419 (55%)	246 (32%)	92 (12%)	757 (86%)
5 v 4	LA	399 (46%)	376 (44%)	90 (10%)	865 (90%)
	MA	373 (43%)	398 (46%)	95 (11%)	866 (90%)
	SC	410 (48%)	368 (43%)	85 (09%)	863 (90%)
	SS	412 (48%)	354 (41%)	98 (11%)	864 (90%)
6 v 5	LA	386 (51%)	301 (40%)	70 (09%)	757 (89%)
	MA	399 (53%)	290 (38%)	68 (09%)	757 (89%)
	SC	358 (47%)	321 (42%)	79 (10%)	758 (89%)
	SS	346 (46%)	336 (44%)	75 (10%)	757 (89%)
7 v 6	LA	354 (45%)	336 (43%)	95 (12%)	789 (91%)
	MA	335 (43%)	348 (44%)	99 (13%)	782 (90%)
	SC	362 (47%)	300 (39%)	111 (14%)	773 (89%)
	SS	334 (43%)	320 (42%)	117 (15%)	771 (89%)
8 v 7	LA	341 (46%)	282 (38%)	115 (16%)	738 (91%)
	MA	342 (46%)	288 (39%)	108 (15%)	738 (91%)
	SC	326 (44%)	310 (42%)	97 (13%)	733 (91%)
	SS	318 (44%)	311 (42%)	103 (14%)	732 (91%)

Description of Data Base for Contrast B: Table 6 reports the number and percentage of cases assigned to each of the three stratum levels for the Reading and Mathematics tests for grades one to three, and to each of the three stratum levels for the Language Arts, Mathematics, Science and Social Studies tests for grades four through eight, in Contrast B. Contrast B consists of cases which were followed longitudinally from pretesting at the conclusion of the 1981-82 school year, to posttesting at the conclusion of the 1982-83 school year. The stratum levels used were those for the 1982-83 school year. Numbers reported in Table 6 reflect cases for which we had complete data on the following variables: stratum level, grade, race, and both pretest and posttest achievement test measures. Because of this requirement, totals do not include cases for which there were incomplete data, either because a student failed to take one of the tests, or because the student moved from the district during the two-year period. Therefore we expected that the number of complete (with no missing data) records would be smaller than the orginal number of records for a given grade during a given school year The right-most column of Table 6 reports the total number of cases in the data base with complete records for each grade. Next to it (in parentheses) is the percentage which that number represents, of the total number of students actually enrolled in the grade at the conclusion of the 1982-83 school year. From these data it is possible to gain information on the representativeness the files used in the Contrast B analysis. In approximately four of the 24 instances, the percentages were greater than 90%; twenty-three of the twenty-four percentages were greater than 85%. We conclude

that a reasonable percentage of the students actually enrolled, during the relevant time period, were represented in the data base.

Table 6

Numbers and Percentages of Students in Merged and Complete Records Across Comparison Years 1981-83: By Stratum and Total

Grade	Subject	Number (%) of Students in Each Stratum			Percent Enrolled in 1983
		Stratum 1	Stratum 2	Stratum 3	Total
2 v 1	RE	523 (67)	227 (29)	34 (04)	784 (88)
	MA	678 (85)	108 (14)	8 (01)	794 (89)
3 v 2	RE	507 (67)	212 (28)	37 (05)	756 (86)
	MA	653 (87)	73 (10)	28 (03)	754 (87)
4 v 3	LA	532 (68)	205 (26)	47 (06)	784 (89)
	MA	520 (66)	212 (27)	53 (07)	785 (89)
	SC	458 (62)	207 (28)	69 (12)	734 (83)
	SS	492 (63)	209 (27)	77 (10)	778 (88)
5 v 4	LA	402 (55)	273 (37)	62 (08)	737 (88)
	MA	376 (51)	307 (42)	56 (07)	739 (88)
	SC	413 (56)	264 (36)	62 (08)	739 (88)
	SS	417 (56)	267 (36)	55 (08)	739 (88)
6 v 5	LA	444 (53)	332 (40)	63 (07)	839 (88)
	MA	443 (53)	322 (38)	74 (09)	839 (88)
	SC	422 (50)	331 (39)	91 (11)	844 (87)
	SS	384 (45)	343 (41)	117 (14)	844 (87)
7 v 6	LA	469 (61)	254 (33)	49 (06)	772 (89)
	MA	412 (53)	291 (38)	70 (09)	773 (89)
	SC	404 (52)	303 (39)	65 (09)	772 (89)
	SS	388 (50)	313 (41)	71 (09)	772 (89)
8 v 7	LA	407 (52)	284 (37)	86 (11)	777 (92)
	MA	400 (52)	306 (39)	70 (09)	776 (92)
	SC	352 (45)	344 (45)	74 (10)	770 (91)
	SS	350 (45)	336 (44)	84 (11)	770 (91)

Description of Data Base for Contrast C: In this contrast, changes in achievement test performance over a two-year period were examined to determine whether particular sequences of stratum assignments produced different patterns of achievement gains or losses. This contrast used data gathered in 1983 as posttest data, and test data from 1981 as pretest data. The data were grouped into nine different sequences of stratum assignments over the two-year period, as are described below:

Sequence 1: Students remain in highest-level stratum
Sequence 2: Students remain in middle-level stratum
Sequence 3: Students remain in lowest-level stratum
Sequence 4: Students move from highest-level to middle-level stratu
Sequence 5: Students move from highest-level to lowest-level stratu
Sequence 6: Students move from middle-level to lowest-level stratum
Sequence 7: Students move from middle-level to highest-level stratu
Sequence 8: Students move from lowest-level to highest-level stratu
Sequence 9: Students move from lowest-level to middle-level stratum

Since any groups with less than ten cases were to be omitted from the analysis, all grade and race combinations within Sequences 5 and 8 were omitted. These groups all failed to satisfy the minimum sample size criterion. Analyses conducted for Contrast C use data described in Tables 6 and 7. Detailed information on the numbers of cases for each stratum sequence, at each grade level is reported for the total group in Tables G1 to G4, for white students in Tables H1 to H4, and for black students in Tables I1 to I4. These Tables may be found in the Appendix.

VI. A Guide to Intermediate Results

Application of the analytic methods described in Section IV. resulted in median achievement scores at time of pretest and at time of posttest for each of the 872 groups used in Contrasts A, B and C. These median scores were converted to percentile ranks in appropriate national norm distributions. Differences between these values were computed and then tested for statistical significance by comparing them with threshold values based on the standard errors of measurement of relevant median differences.

All of these computations resulted in tables of intermediate results that were then used in final summary analyses reported in Section VI., below. These tables are provided in a series of appendices to this report. The appendices are organized as follows:

1. The results of Contrast A are reported in Appendices A, B, and C.

   Results for all students, regardless of race, are reported in Appendix A. Separate tables are provided for tests in each subject area -- Reading/Language Arts, Mathematics, Science, and Social Studies.

   Results for white students are reported in Appendix B. The organization of Appendix B is identical to that of Appendix A.

   Results for black students are reported in Appendix C. The organization of Appendix C is identical to that of Appendix A.

2. The results of Contrast B are reported in Appendices D, E, and F.

Results for all students, regardless of race, are reported in Appendix D. Separate tables are provided for tests in each subject area -- Reading/Language Arts, Mathematics, Science, and Social Studies.

Results for white students are reported in Appendix E. The organization of Appendix E is identical to that of Appendix D.

Results for black students are reported in Appendix F. The organization of Appendix F is identical to that of Appendix D.

3. The results of Contrast C are reported in Appendices G, H, and I.

Results for all students, regardless of race, are reported in Appendix G. Separate tables are provided for tests in each subject area -- Reading/Language Arts, Mathematics, Science, and Social Studies.

Results for white students are reported in Appendix H. The organization of Appendix H is identical to that of Appendix G.

Results for black students are reported in Appendix I. The organization of Appendix I is identical to that of Appendix I.

VII. Results

A. Organization of This Section

Since data for this study were analyzed in great detail, it would be possible to report the results of these analyses in great detail as well. Because the sheer volume of findings might obscure the importance and clarity of the summary of essentials, we have chosen to avoid the temptation of presenting separate findings for each of the 216 groups used as units of analysis in each of the two years of the evaluation, and for each of the 420 groups used in our analyses of ability grouping effects across the 1981-83 school years. We will, instead, confine this discussion to interpretation of two summary tables. One, Table 7, contains a final summary of findings for the 1981-82 school year (labeled Contrast A) and a final summary of findings for the 1982-83 school year (labeled Contrast B). The other, Table 8, contains a final summary of findings across the 1981-82 and 1982-83 school years, that is, for a two-year instructional span. These results are labeled Contrast C.

In this section, we first discuss results for Contrasts A, B and C in sequence, and then summarize the findings of the evaluation across all three contrasts. Within each contrast, we examine results for all students regardless of race, and then discuss findings for white students and black students. This discussion is structured around the three research questions, cited above, that motivated the evaluation.

B. Results for Contrast A: 1981-82 School Year

The upper portion of Table 7 presents a summary of results for the 1981-82 school year. This portion of the table is divided into three sections, headed "Total Group," "White Group," and "Black Group." These sections contain summary findings for all students regardless of race, for white students, and for black students, respectively.

In the evaluation procedure described above, the basic unit of analysis is a group of students defined by a grade level, a teaching group, and an instructional subject; an example would be a group of third-graders assigned to a high-level instructional group in language arts. Achievement test data were analyzed for each of 216 groups of students defined in this way, to determine how the difference between the group's median achievement test score at time of pretest administration and the group's median achievement test score at the time of posttest administration compared to a threshhold value that indicated a minimum reliable change in median values. The results of these comparisons were classified in one of four ways, as shown in Table 7. If fewer than ten students composed a group, that group's sample size was deemed too small to permit a reliable analysis. The numbers of groups that fell into this category are shown to right of the heading "<10 Exclude." If the median test achievement for a group at the time of posttest administration exceeded the median test achievement for the group at the time of pretest administration by at least the threshhold value, that group was classified as having made a significant gain in median achievement. The numbers

of groups that fell into this category are shown to the right of the heading "*G." If the median test achievement for a group at the time of posttest administration fell below the median test achievement for the group at the time of pretest administration by at least the threshhold value, that group was classified as having made a significant loss in median achievement. The numbers of groups that fell into this category are shown to the right of the heading "*L." Finally, if the median test achievement of a group at the time of posttest administration differed from the median test achievement for the group at the time of pretest administration by less than the threshhold value, that group was classified as having no significant difference in median achievement. Numbers of groups that fell into this category are shown to the right of the heading "NS."

Three levels of instructional group were used by the Pitt County School System. In Table 7 the highest level is denoted by "Strat. 1," the middle level is denoted by "Strat. 2," and the lowest level is denoted by "Strat. 3." Results for these three grouping levels are shown below these respective headings.

Evaluation Question 1: The first evaluation question to be investigated in this study was: "Do students assigned to each level of ability group or teaching group demonstrate progress in tested achievement that is at least as great as they would have exhibited, had they been randomly assigned to heterogeneous classes within their grade?". To answer this question for Contrast A (1981-82), we will examine data in Table 7 for the "Total Group" of students.

Evaluation Question 1 would be answered affirmatively for

the 72 groupings of students that compose the Total Group, provided the number of groups that suffered a significant loss in achievement did not exceed the number of groups that enjoyed a significant gain in achievement, to a statistically significant degree. In the column headed "All" in the "Total Group" section of Table 7 for Contrast A, note that, of the 72 groups of students tested in 1981-82, 31 groups exhibited a significant gain in achievement median, 9 groups exhibited a significant loss in achievement median, and 32 groups did not exhibit a significant change in achievement median. Sufficient data were available for all 72 groups to permit a reliable examination of this question.

The Sign Test (Siegel, 1956) was applied to summary data in Table 7 to determine whether the numbers of groups that exhibited a significant gain in median achievement, or a significant loss in median achievement, exceeded the numbers of groups in the contrasting category by a statistically significant amount. In the case under discussion, all 72 groupings of students during the 1981-82 school year, even though gaining groups exceeded losing groups by 31 to 9, the difference was <u>not</u> statistically significant. For all students examined during the 1981-82 school year then, we conclude that Evaluation Question 1 is answered affirmatively. Students assigned to ability groups or teaching groups appear to have progressed in median tested achievement at the same rate as they would have exhibited, had they been assigned to heterogeous classes within their grade.

We can examine Evaluation Question 1 in greater detail by

considering separate analyses of findings for the 24 groups of students assigned to Stratum 1 (the highest-level instructional groups), for the 24 groups of students assigned to Stratum 2 (the middle-level instructional groups), and for the 24 groups of students assigned to Stratum 3 (the lowest-level instructional groups).

Of the 24 groups assigned to Stratum 1, seven groups exhibited significant gains in median achievement, six groups exhibited significant losses in median achievement, and 11 groups did not exhibit a significant change in either direction. When we applied the Sign Test to these findings, **we concluded that there was no evidence of a significant shift in median achievement for the 24 groups of students assigned to the highest-level teaching group. Evaluation Question 1 is answered affirmatively for students assigned to the highest-level teaching or ability groups.**

Of the 24 groups assigned to Stratum 2, 14 groups exhibited significant gains in median achievement, three groups exhibited significant losses in median achievement, and seven groups did not exhibit a significant change in either direction. When we applied the Sign Test to these findings, **we concluded that there was evidence of a significant gain in median achievement ($p < 0.05$) for the 24 groups of students assigned to the middle-level teaching group. Evaluation Question 1 is answered affirmatively for students assigned to the middle-level teaching or ability groups. In fact, these students appear to be progressing in median achievement at a rate that exceeds their expected rate of progress, had they been randomly assigned to heterogeneous classes within their grade.**

Of the 24 groups assigned to Stratum 3, 10 groups exhibited significant gains in median achievement, no groups exhibited significant losses in median achievement, and 14 groups did not exhibit a significant change in either direction. When we applied the Sign Test to these findings, we concluded that there was evidence of a significant gain in median achievement ($p < 0.01$) for the 24 groups of students assigned to the lowest-level teaching group. Evaluation Question 1 is answered affirmatively for students assigned to the lowest-level teaching or ability groups. In fact, these students appear to be progressing in median achievement at a rate that exceeds their expected rate of progress, had they been randomly assigned to heterogeneous classes within their grade.

Evaluation Question 2. The second evaluation question to be examined in this study was: "What is the comparative effect of assignment to ability groups or teaching groups, for black students and white students?". To examine this question for Contrast A (1981-82), we will discuss data shown in the "White Group" and "Black Group" portions of Table 7. Analyses of these data paralleled those discussed for the "Total Group," above.

When data for the 72 groups of white students were analyzed collectively, we found that four groups had sample sizes too small to permit reliable investigation of the change in pretest-to-posttest median achievement, 22 groups exhibited significant gains in median achievement, seven groups exhibited significant losses in median achievement, and 39 groups did not exhibit a significant change in either direction. Of the 29 groups that

exhibited a significant change in median achievement in one direction or the other, 22 groups had a positive change. Application of the Sign Test revealed that this finding was statistically significant ($p < 0.01$). **Overall then, ability grouping appears to be facilitative for white students. Their growth in median achievement is larger than the amount expected, had they been randomly assigned to heterogeneous classes within their grade.**

When data for the 72 groups of black students were analyzed collectively, we found that 18 groups exhibited significant gains in median achievement, 13 groups exhibited significant losses in median achievement, and 41 groups did not exhibit a significant change in either direction. Of the 31 groups that exhibited a significant change in median achievement in one direction or the other, 18 groups had a positive change. Application of the Sign Test revealed that this finding was not statistically significant. **Overall then, ability grouping appears to be neither facilitative nor inhibiting for black students. Their growth in median achievement is the same as would be expected, had they been randomly assigned to heterogeneous classes within their grade.**

Evaluation Question 3. The third evaluation question posed in this study was: "What is the comparative effect of assignment to ability groups or teaching groups, for students assigned to different levels of teaching groups or ability groups (i.e., low, medium, high)? When we discussed Evaluation Quesion 1 in detail for students tested during the 1981-82 school year (Contrast A), we considered the findings shown in Table 7 for "Stratum 1," "Stratum 2," and "Stratum 3." Those findings are relevant to the current question as well.

We found earlier that the 24 Stratum 1 groups did not exhibit frequencies of gains or losses in median achievement that differed significantly from those expected by chance under the Sign Test. Therefore, we concluded that students assigned to the highest-level instructional groups appeared to be progressing in median achievement at the rate to be expected, had they been randomly assigned to heterogeneous classes. We also found that the 24 Stratum 2 groups and the 24 Stratum 3 groups progressed in median achievement at a rate that significantly exceeded their expected rate, had students in these groups been randomly assigned to homogeneous classes within their grade. **From these collective findings, it appears that ability grouping is most facilitative for students assigned to the lowest-level instructional groups, is significantly facilitative for students assigned to middle-level instructional groups, and neither inhibits nor facilitates nor inhibits the growth in median achievement of students assigned to the highest-level instructional groups.**

C. Results for Contrast B: 1982-83 School Year

The lower portion of Table 7 presents a summary of results for the 1982-83 school year. This portion of the table is organized in the same way as the upper portion for Contrast A. It is divided into three sections, headed "Total Group," "White Group," and "Black Group." These sections contain summary findings for all students regardless of race, for white students, and for black students, respectively.

We will discuss the findings for the 1982-83 school year in the same order as those discussed for the 1981-82 school year.

Each of the three major evaluation questions that motivated this study will be considered separately.

Evaluation Question 1. In the column headed "All" in the "Total Group" section of Table 7 for Contrast B, note that, of the 72 groups of students tested during the 1982-83 school year, one group had a sample size that was too small to permit reliable investigation of the change in pretest-to-posttest achievement, 18 groups exhibited significant gains in median achievement, 15 groups exhibited significant losses in median achievement, and 38 groups did not exhibit a significant change in either direction. The number of groups that exhibited a significant gain in median achievement was almost equal to the number that exhibited a significant loss in median achievement. As expected, when the Sign Test was applied, the difference between the numbers of gaining and losing groups was not found to be statistically significant. For all students tested during the 1982-83 school year then, we conclude that Evaluation Question 1 is answered affirmatively. Students assigned to ability groups or teaching groups appear to have progressed in median tested achievement at the same rate as they would have exhibited, had they been randomly assigned to homogeneous classes within their grade.

Once again, we will consider separate analyses of findings for the 24 groups of students assigned to Stratum 1 (the highest-level instructional groups), for the 24 groups of students assigned to Stratum 2 (the middle-level instructional groups), and for the 24 groups of students assigned to Stratum 3 (the lowest-level instructional groups).

Of the 24 groups assigned to Stratum 1, three groups exhibited significant gains in median achievement, 10 groups exhibited significant losses in median achievement, and 11 groups did not exhibit a significant change in either direction. When we applied the Sign Test to these findings, we concluded that there was evidence of a significant loss in median achievement ($p < 0.10$) for the 24 groups of students assigned to the highest-level instructional stratum. Evaluation Question 1 is therefore answered negatively for students assigned to the highest-level teaching or ability groups. Students assigned to these groups did not exhibit progress in median achievement as great as the rate to be expected, had they been randomly assigned to heterogenous classes within their grade.

Of the 24 groups assigned to Stratum 2, six groups exhibited significant gains in median achievement, five groups exhibited significant losses in median achievement, and 13 groups did not exhibit a significant change in either direction. When we applied the Sign Test to these findings, we concluded that there was no evidence of a significant shift in median achievement ($p > 0.10$) for the 24 groups of students assigned to the middle-level instructional stratum. Evaluation Question 1 is answered affirmatively for students assigned to the middle-level teaching or ability groups. These students appear to be progressing in median achievement at a rate that is equal to their expected rate of progress, had they been randomly assigned to heterogeneous classes within their grade.

Of the 24 groups assigned to Stratum 3, we found that one

group had a sample size that was too small to permit reliable investigation of its change in pretest-to-posttest median achievement, nine groups exhibited significant gains in median achievement, no groups exhibited significant losses in median achievement, and 14 groups did not exhibit a significant change in either direction. When we applied the Sign Test to these findings, we concluded that there was evidence of a significant gain in median achievement ($p < 0.01$) for the 24 groups of students assigned to the lowest-level instructional stratum. Evaluation Question 1 is answered affirmatively for students assigned to the middle-level teaching or ability groups. In fact, these students appear to be progressing in median achievement at a rate that exceeds their expected rate of progress, had they been randomly assigned to heterogeneous classes within their grade.

Evaluation Question 2. To examine Evaluation Question 2 for Contrast B (1982-83), we will discuss data shown in the lower "White Group" and "Black Group" portions of Table 7. Analyses of these data paralleled those discussed for the "Total Group," above.

When data for the 72 groups of white students were analyzed collectively, we found that five groups had sample sizes too small to permit reliable investigation of the change in pretest-to-posttest median achievement, 18 groups exhibited significant gains in median achievement, 11 groups exhibited significant losses in median achievement, and 38 groups did not exhibit a significant change in either direction. Of the 29 groups that exhibited a significant change in median achievement in one direction or the other, 18 groups had a positive change. Applica-

tion of the Sign Test revealed that the proportion of groups with significant median gains in achievement did not differ significantly from the proportion of groups with significant median losses in achievement ($p > 0.10$). Overall then, ability grouping appears to be neither facilitative nor inhibiting for white students. Their growth in median achievement is similar to the amount expected, had they been randomly assigned to heterogeneous classes within their grade.

When data for the 72 groups of black students were analyzed collectively, we found that one group was too small to permit reliable investigation of its change in median achievement from pretest to posttest, 10 groups exhibited significant gains in median achievement, 16 groups exhibited significant losses in median achievement, and 45 groups did not exhibit a significant change in either direction. Of the 26 groups that exhibited a significant change in median achievement in one direction or the other, only 10 groups had a positive change. Although more groups of black students exhibited significant losses in median achievement than exhibited significant gains, application of the Sign Test revealed that this finding was not statistically significant ($p > 0.10$). Overall then, ability grouping appears to be neither facilitative nor inhibiting for black students. Their growth in median achievement is about the same as would be expected, had they been randomly assigned to heterogeneous classes within their grade. Compared to groups defined for white students, more of the groups defined for black students suffered losses in median achievement during the 1982-83 school year. However, the differ-

ence between the performances of groups defined for black and white students is not statistically significant.

Evaluation Question 3. To reiterate, the third evaluation question posed in this study was: "What is the comparative effect of assignment to ability groups or teaching groups, for students assigned to different levels of teaching groups or ability groups (i.e., low, medium, high)? When we discussed Evaluation Quesion 1 in detail for students tested during the 1982-83 school year (Contrast B), we considered the findings shown in the lower portion of Table 7 for "Stratum 1," "Stratum 2," and "Stratum 3." Those findings are relevant to Evaluation Question 3 as well.

We found earlier that the 24 Stratum 1 groups exhibited a proportion of significant losses in median achievement that differed significantly from that expected by chance under the Sign Test. Therefore, we concluded that students assigned to the highest-level instructional groups appeared to be suffering losses in median achievement compared to the test performance that would be expected, had they been randomly assigned to heterogeneous classes. We also found that the 24 Stratum 2 groups progressed in median achievement at about the rate that would be expected, had they been randomly assigned to heterogeneous classes within their grade, and that the 24 Stratum 3 groups progressed in median achievement at a rate that significantly exceeded their expected rate, had students in these groups been randomly assigned to homogeneous classes within their grade. From these collective findings, it appears that ability grouping is facilitative for students assigned to the lowest-level instructional groups, is neither facilitative nor inhibiting for stu-

dents assigned to middle-level instructional groups, and inhibits the growth in median achievement of students assigned to the highest-level instructional groups.

D. Comparison of Results for the 1981-82 and the 1982-83 School Years (Contrast A and Contrast B)

Some of the results discussed above for the 1981-82 and the 1982-83 school years were consistent for both years, and others were not. During both years, ability grouping appeared to have little effect on the median test performances of students when data were analyzed collectively, regardless of the race of the students. In both school years, the numbers of groups of students that had significantly higher median posttest scores than median pretest scores exceeded the numbers of groups of students for which the reverse was true. In neither year did the proportion of "gaining" groups differ significantly from the proportion of "losing" groups ($p > 0.10$). However, the descriptive data show that proportionately more groups gained in 1981-82 (31 out of 40) than in 1982-83 (only 18 out of 33).

From the results reported for Contrast A (1981-82), we concluded that, in terms of growth in median tested achievement, ability grouping appeared to be facilitative for white students and neither facilitative nor inhibiting for black students. From the results reported for Contrast B (1982-83), we concluded that ability grouping appeared to be neither facilitative nor inhibiting for students of either race. From the data in Table 7 it is clear that a higher proportion of groups defined for white students and black students had gains in median achievement

Results of the analyses of data in Contrast C are presented in Table 8. The basic organization of this table parallels that of Table 7, but some important differences require discussion. First, all instructional groups that satisfied a particular sequence of levels during the 1981-82 and 1982-83 school years (e. g., lowest-level during 1981-82 and lowest-level during 1982-83) were analyzed together. Theoretically, since three levels of instructional groups operated in each of two school years, nine such sequences could be identified. However, the numbers of students assigned to two of the potential sequences (highest-level during 1981-82 followed by lowest-level during 1982-83, and lowest-level during 1981-82 followed by highest-level during 1982-83) were so small that reliable analyses of these sequences was not possible. The remaining seven sequences of instructional groupings are defined in the following table:

Sequence	Assignment During 1981-82	Assignment During 1982-83
1	Highest-level	Highest-level
2	Middle-level	Middle-level
3	Lowest-level	Lowest-level
4	Highest-level	Middle-level
6	Middle-level	Lowest-level
7	Middle-level	Highest-level
9	Lowest-level	Middle-level

Note that the two omitted sequences, defined above, were numbered 5 and 8.

For each instructional sequence, the basic unit of analysis was a group of students defined by a sequence of grade levels and

a subject area; an example would be a group of students who were in the third grade during the 1981-82 school year who were assigned to the highest-level instructional group in mathematics during that year, who were in the fourth grade during the 1982-83 school year, and who were assigned to the highest-level instructional group during that year. This group of students constitutes one of the 20 groups that define units of analysis for Sequence 1. As shown in Table 8, 20 groups of students were defined in the manner described above for each of the seven sequences listed above, for each of the three major analyses reported in Table 8: analyses of data for all students regardless of race, analyses for white students, and analyses for black students.

Evaluation Question 1: We will consider results reported in the top portion of Table 8, labeled "Total Group," in this discussion of Evaluation Question 1. Note first that data for 140 groups of students who received instruction under all sequences for which sufficient data were available are summarized in the right-most column of Table 8 (the column heading is "All"). Of these 140 groups, 8 groups were too small to permit reliable investigation of changes in 1981-to-1983 median achievement, 44 groups exhibited significant gains in median achievement, 41 groups exhibited significant losses in median achievement, and 47 groups did not exhibit a significant change in either direction. When these frequencies were analyzed using the Sign Test, it was found that that proportion of groups that exhibited significant gains in median achievement did not differ significantly from the proportion of groups that exhibited significant losses in median

achievement ($p > 0.10$). We must therefore conclude that, overall, students assigned to ability groups or teaching groups demonstrate progress in tested achievement that is about the same as they would have exhibited, had they been randomly assigned to heterogeneous classes within their grades during the 1981-82 and 1982-83 school years.

Use of the Sign Test resulted in the same conclusion when it was applied to data from Sequences 1, 2, and 3. Recall that these sequences include all students who were assigned to the same level of instructional group (either the highest-level in both years, the middle-level in both years, or the lowest-level in both years) during the two successive school years. Only for Sequence 1 is it true that the number of groups that had significantly lower median achievement test scores in 1983 than in 1981 appreciably exceeded the number of groups that had significantly higher median achievement test scores in 1983 than in 1981. Even for this sequence, the difference in proportions of gaining and losing groups was not statistically significant.

For Sequences 4 and 6, composed of students who were assigned to lower-level instructional groups during the 1982-83 school year than during the 1981-82 school year, the proportion of groups that had significantly lower median achievement test scores in 1983 than in 1981 exceeded the proportion of groups that had significantly higher median achievement test scores in 1983 than in 1981 by a significant amount ($p < 0.01$ for Sequence 4 and $p < 0.05$ for Sequence 6). Thus the students assigned to these sequences of instructional groups did not progress in median tested achievement at the rate expected, had they been

randomly assigned to heterogeneous classes within their respective grades during the two school years.

For Sequences 7 and 9, composed of students who were assigned to higher-level instructional groups during the 1982-83 school year than during the 1981-82 school year, the proportion of groups that had significantly higher median achievement test scores in 1983 than in 1981 exceeded the proportion of groups that had significantly lower median achievement test scores in 1983 than in 1981 by a significant amount ($p < 0.01$ for both sequences). Thus the students assigned to these sequences of instructional groups progressed in median tested achievement at a higher rate than would be expected, had they been randomly assigned to heterogeneous classes within their respective grades during the two school years.

In summary, assignment to ability-grouped instruction, rather than to heterogeneous classes during a two-year period, appears to have little overall effect on students' achievement progress. Such assignment appears to be somewhat inhibiting for students whose instructional assignment in the second year of a two-year sequence is to a lower-level group than in the first year, and to be somewhat facilitative for students whose instructional assignment in the second year of a two-year sequence is to a higher-level group than in the first year.

Evaluation Question 2. The comparative achievement progress of white students and black students over the 1981-to-1983 timespan can be determined from data presented in the lower portion of Table 8. In the section headed "White Group," the right-most

column of data contains results for all 140 groups defined for white students, regardless of their assignment to an instructional sequence. Of these 140 groups, 54 were too small to permit a reliable examination of students' achievement progress, 29 exhibited signficant gains in median achievement over the 1981-to-1983 timespan, 25 exhibited significant losses in median achievement over the 1981-to-1983 timespan, and 32 did not exhibit a significant change in median achievement in either direction. **Thus, white students assigned to ability-grouped instruction appeared to progress in median achievement at about the rate expected, had they been randomly assigned to heterogeneous classes during the two years of the evaluation.**

In the section of Table 8 headed "Black Group," the rightmost column of data contains results for all 140 groups defined for black students, regardless of their assignment to an instructional sequence. Of these 140 groups, 15 were too small to permit a reliable examination of students' achievement progress, 34 exhibited signficant gains in median achievement over the 1981-to-1983 timespan, 35 exhibited significant losses in median achievement over the 1981-to-1983 timespan, and 56 did not exhibit a significant change in median achievement in either direction. **Thus, black students assigned to ability-grouped instruction appeared to progress in median achievement at about the rate expected, had they been randomly assigned to heterogeneous classes during the two years of the evaluation.**

In summary, both black students and white students appeared to have median achievement growth that was about the same as would be expected, had they been randomly assigned to hetero-

geneous classes within their appropriate grade levels, during the 1981-82 and 1982-83 school years. **Ability grouping did not appear to have differential racial effects for students whose achievement progress could be tracked across two school years.**

Evaluation Question 3: The detailed analysis presented in response to Evaluation Question 1 for Contrast C, above, is also pertinent to Evaluation Question 3. In fact, our earlier summary applies well to this evaluation question: Assignment to ability-grouped instruction, rather than to heterogeneous classes during a two-year period, appears to have little effect on students' whose instructional assignment is consistent over the two years of the evaluation; i.e., they were assigned to the same level of instructional group in both years. Such assignment appears to be somewhat inhibiting for students whose instructional assignment in the second year of a two-year sequence is to a lower-level group than in the first year, and to be somewhat facilitative for students whose instructional assignment in the second year of a two-year sequence is to a higher-level group than in the first year.

F. Caveats

In planning and conducting this evaluation, we have attempted to be realistic in our treatment of data and mindful of statistical artifacts that cloud valid interpretation of results. For example, when analyzing achievement test data for groups of students, we have focused on the groups' median scores rather than their means, so as to avoid the undue influence of outlying observations. Our unit of analysis was a group of students rather

than an individual student, so as to reduce the confounding effects of unreliability in the achievement tests. We defined a reasonably high threshhold for the classification of "significant" effects, so as to reduce the influence of statistical regression bias. And finally, we used a non-parametric statistical test in our investigations of significance, so as to eliminate the need for indefensible scaling assumptions and specific assumptions concerning distributional shapes and homogeneity of variances.

However, in this study, as in all non-experimental studies of education policy, one must be cautious in attributing causation. We have described our results as though the only causal factor was assignment of students to differentiated instructional groups on the basis of their initial achievement (termed "ability grouping"). The reader must bear in mind that other, uninvestigated casual factors might have contributed to the achievement results we have presented. For example, our methodological devices for eliminating the influences of statistical regression bias might not have totally successful. Certainly, the finding that students initially assigned to the lowest-level instructional groups gained most in median achievement, and that students initially assigned to the highest-level instructional groups lost most in median achievement is consistent with this supposition. Although these findings are indisputably "real," their attribution to ability grouping as the sole causal factor is disputable.

Table 7

Summary of Results of Significance Tests: Contrasts A and B

Contrast A: Summary of Significance Tests: 1981-82

	Total Group				White Group				Black Group			
	Strat. 1	Strat. 2	Strat. 3	All	Strat. 1	Strat. 2	Strat. 3	All	Strat. 1	Strat. 2	Strat. 3	Al
<10 Exclude	0	0	0	0	0	0	4	4	0	0	0	0
*G	7	14**	10***	31	6	9***	7**	22***	1	8	9***	18
*L	6	3	0	9	7	0	0	7	10**	3	0	13
NS	11	7	14	32	11	15	13	39	13	13	15	41
Total	24	24	24	72	24	24	24	72	24	24	24	72

Contrast B: Summary of Significance Tests: 1982-83

	Total Group				White Group				Black Group			
	Strat. 1	Strat. 2	Strat. 3	All	Strat. 1	Strat. 2	Strat. 3	All	Strat. 1	Strat. 2	Strat. 3	Al
<10 Exclude	0	0	1	1	0	0	5	5	0	0	1	1
*G	3	6	9***	18	1	10*	7*	18	1	3	6**	10
*L	10*	5	0	15	7*	3	1	11	12**	4	0	16
NS	11	13	14	38	16	11	11	38	11	17	17	45
Total	24	24	24	72	24	24	24	72	24	24	24	72

*p<.10
**p<.05
***p<.01

Table 8

Contrast C: Summary of Significance Tests: 1981-83

Total Group	Sequence 1	Sequence 2	Sequence 3	Sequence 4	Sequence 6	Sequence 7	Sequence 9	All
<10 Exclude	0	0	3	0	2	0	3	8
*G	4	7	3	1	0	14***	15***	44
*L	10	6	0	18***	7**	0	0	41
NS	6	7	14	1	11	6	2	47
Total	20	20	20	20	20	20	20	140

White Group	Sequence 1	Sequence 2	Sequence 3	Sequence 4	Sequence 6	Sequence 7	Sequence 9	All
<10 Exclude	0	2	17	1	18	2	14	54
*G	5	6	0	0	0	13***	5*	29
*L	8	4	0	13***	0	0	0	25
NS	7	8	3	6	2	5	1	32
Total	20	20	20	20	20	20	20	140

Black Group	Sequence 1	Sequence 2	Sequence 3	Sequence 4	Sequence 6	Sequence 7	Sequence 9	All
<10 Exclude	0	0	5	1	3	2	4	15
*G	1	7	2	0	0	10**	14***	34
*L	8**	5	0	16***	5*	1	0	35
NS	11	8	13	3	12	7	2	56
Total	20	20	20	20	20	20	20	140

*p<.10
**p<.05
***p<.01

APPENDIX A: Intermediate Results for Contrast A, Total Group

Table A1

Summary of Contrast A for 1981-82 Data Base: Percentile Ranks for Each Year, Differences, and Significance: Total Group

		Stratum 1			Stratum 2			Stratum 3		
		80-81	81-82		80-81	81-82		80-81	81-82	
Grade	Subject	PR1	PR2	Diff	PR1	PR2	Diff	PR1	PR2	Diff
2 v 1	RE	82	84	+2 *	47	46	-1	20	20	0
	MA	93	91	-2	52	63	+11 *	36	24	-12
3 v 2	RE	86	77	-9 *	46	39	+7 *	12	11	-1
	MA	91	79	-12 *	42	40	-2	15	19	+4
4 v 3	LA	85	80	-5 *	46	44	-2	14	20	+6 *
	MA	81	76	-5 *	42	40	-2	14	20	+6 *
	SC	80	80	0	46	50	+4 *	17	24	+7 *
	SS	80	77	-3 *	43	48	+5 *	17	26	+9 *
5 v 4	LA	80	85	+5 *	42	50	+8 *	16	17	+1
	MA	80	85	+5 *	42	47	+5 *	16	19	+3
	SC	83	75	-8	46	41	-5 *	14	25	+11 *
	SS	77	73	-4	44	44	0	18	17	-1
6 v 5	LA	82	84	+2	45	51	+6 *	14	21	+7 *
	MA	81	80	-1	42	45	+3 *	16	20	+4
	SC	79	82	+3 *	41	46	+5 *	11	23	+12 *
	SS	77	77	0	44	45	+1	13	18	+5 *
7 v 6	LA	84	85	+1	40	46	+6 *	14	18	+4
	MA	80	85	+5 *	41	48	+7 *	12	22	+10 *
	SC	78	72	-6 *	41	47	+6 *	15	24	+9 *
	SS	77	79	+2 *	42	44	+2 *	14	23	+9 *
8 v 7	LA	83	87	+4 *	41	46	+5	16	17	+1
	MA	80	78	-2	43	48	+5 *	15	18	+3 *
	SC	75	79	+4	42	43	+1	16	16	0
	SS	82	81	-1	44	43	-1	14	18	+4

*Significant difference.

Table A2

Reading/Language Arts: 1981-82, Total Group

Grade in 1981-82		Stratum 1		Stratum 2		Stratum 3	
		80-81	81-82	80-81	81-82	80-81	81-82
2 v 1	n	534	534	246	246	40	40
	P_{25}	328	380.75	293	333.75	247	291.5
	P_{50}	344	413	303	354.5	266	315
	P_{75}	359	449	310	377	291	337.75
3 v 2	n	461	461	216	216	26	26
	P_{25}	393	63.5	344	47	285.5	22.75
	P_{50}	418	67	356	54	299	31.5
	P_{75}	447	70	365	60	309	39.25
4 v 3	n	421	421	266	266	73	73
	P_{25}	39	47	31	34	18	22
	P_{50}	42	52	34	41	22	28
	P_{75}	44	56	36	46	25	33.5
5 v 4	n	399	399	376	376	90	90
	P_{25}	49	49	35	38	22	24
	P_{50}	52	54	40	43	25	28
	P_{75}	56	58	44	48	28	34.25
6 v 5	n	386	386	301	301	70	70
	P_{25}	50	51	37	40	23	25
	P_{50}	53	54	41	45	26	30.5
	P_{75}	57	58	44	49	29	36
7 v 6	n	354	354	336	336	95	95
	P_{25}	51	48	36	33	23	23
	P_{50}	54	52	41	38	27	26
	P_{75}	57	57	45	43	30	31
8 v 7	n	341	341	282	282	115	115
	P_{25}	47	50	32	36	21	22
	P_{50}	51	54	36	41	25	28
	P_{75}	55.5	57	40	46	27	35

Table A3

Mathematics Test Performance: 1981-82, Total Group

Grade in 1981-82		Stratum 1		Stratum 2		Stratum 3	
		80-81	81-82	80-81	81-82	80-81	81-82
2 v 1	n	673	673	134	134	12	12
	P_{25}	335	375	307	344.5	284	307
	P_{50}	354	395	314	363.5	290.5	331
	P_{75}	376	421	322.5	381	308	359.5
3 v 2	n	579	579	102	102	22	22
	P_{25}	376	63	340.75	44	307.25	27.75
	P_{50}	396	71	349.5	50	319.5	35
	P_{75}	418	77	357	58.25	323	45.75
4 v 3	n	444	444	238	238	80	80
	P_{25}	66	55	44	37	25	24.25
	P_{50}	72	63.5	51	45	29.5	31
	P_{75}	78	71	56.25	51	35	38
5 v 4	n	373	373	398	398	95	95
	P_{25}	60	63	40	40	23	23
	P_{50}	66	70	46	49	28	30
	P_{75}	73	76	51	56	32	37
6 v 5	n	399	399	290	290	68	68
	P_{25}	61	56	41	39	23.25	24.25
	P_{50}	68	64	46	46	28	30.5
	P_{75}	74	73	51.25	52	31	38
7 v 6	n	335	335	348	348	99	99
	P_{25}	58	56	38	32	22	20
	P_{50}	64	65	44	39	25	25
	P_{75}	71	74	49	47	29	30
8 v 7	n	342	342	288	288	108	108
	P_{25}	54	59	31	39	18	24.25
	P_{50}	61	66	36	47	22	30
	P_{75}	69	71	42	52	23.75	36

Table A4

Science Test Performance: 1981-82, Total Group

Grade in 1981-82		Stratum 1		Stratum 2		Stratum 3	
		80-81	81-82	80-81	81-82	80-81	81-82
4	n	421	421	243	243	88	88
	P_{25}	22	25	15	19	9	12
	P_{50}	25	29	17	22	11	16
	P_{75}	28	32	18	25	12	19.75
5	n	410	410	368	368	85	85
	P_{25}	27	20	18	14	11	10
	P_{50}	30	23	21	16	13	13
	P_{75}	32	27	23	19	15	16
6	n	358	358	321	321	79	79
	P_{25}	21	23.7	14	16	9	11
	P_{50}	24	27	16	19	10	14
	P_{75}	27	30	20	22	12	17
7	n	362	362	300	300	111	111
	P_{25}	24	22	16	16	10	11
	P_{50}	26	26	18	19	12	14
	P_{75}	29	31	20	22	113	17
8	n	326	326	310	310	97	97
	P_{25}	24	27	16	16	9.5	11
	P_{50}	27	31	18	20	12	13
	P_{75}	31	35	20	24	13	16.5

Table A5

Social Studies Test Performance: 1981-82, Total Group

Grade in 1981-82		Stratum 1		Stratum 2		Stratum 3	
		80-81	81-82	80-81	81-82	80-81	81-82
4	n	419	419	246	246	92	92
	P_{25}	20	25	12	16	7.25	11
	P_{50}	24	29	14	20	9	14
	P_{75}	28	32	17	24	10	18
5	n	412	412	354	354	98	98
	P_{25}	26	21	16	13	9	9
	P_{50}	29	25	19	17	12	11
	P_{75}	32	29	22	19	13	13.25
6	n	346	346	336	336	75	75
	P_{25}	23	25	14	18	9	10
	P_{50}	26	28	17	20	10	12
	P_{75}	29	31	19	23	11	16
7	n	334	334	320	320	117	117
	P_{25}	26	25	17	14	10	10.5
	P_{50}	28	30	19	18	11	13
	P_{75}	31	34	22	22	12	15
8	n	318	318	311	311	103	103
	P_{25}	27	30	15	16	9	10
	P_{50}	31	34	18	21	11	13
	P_{75}	34	37	21	27	12	16

APPENDIX B: Intermediate Results for Contrast A, White Students

Table B1

Summary of Contrast A for 1981-82 Data Base: Percentile Ranks for Each Year, Difference, and Significance: Whites Only

Grade	Subject	Stratum 1 PR1	Stratum 1 PR2	Stratum 1 Diff	Stratum 2 PR1	Stratum 2 PR2	Stratum 2 Diff	Stratum 3 PR1	Stratum 3 PR2	Stratum 3 Diff
2 v 1	RE	86	89	+3	50	48	-2	N/A	N/A	N/A
	MA	97	97	0	54	73	+19*	N/A	N/A	N/A
3 v 2	RE	88	81	-7*	48	41	-7	N/A	N/A	N/A
	MA	96	85	-11*	49	42	-7	N/A	N/A	N/A
4 v 3	LA	85	85	0	46	47	+1	20	29	+9
	MA	83	76	-7*	47	46	-1	9	21	+12*
	SC	83	83	0	51	59	+8*	17	41	+24*
	SS	82	81	-1	48	55	+7*	17	26	+9
5 v 4	LA	83	88	+5*	44	56	+12*	18	17	-1
	MA	83	88	+5*	43	51	+8*	14	17	+3
	SC	87	79	-8*	46	47	+1	12	38	+26*
	SS	81	77	-4	48	44	-4	9	17	+8
6 v 5	LA	85	87	+2	50	54	+4	14	22	+8
	MA	85	84	-1	44	47	+3	15	19	+4
	SC	83	86	+3*	47	51	+4	16	23	+7
	SS	81	81	0	47	48	+1	17	18	+1
7 v 6	LA	84	88	+4*	42	51	+9*	18	20	+2
	MA	84	87	+6*	43	51	+8*	14	26	+12*
	SC	82	75	-7*	46	53	+7*	11	29	+18*
	SS	81	82	+1	45	47	+2	18	28	+10*
8 v 7	LA	83	87	+4*	46	49	+3	18	16	-2
	MA	83	79	-4*	46	50	+4*	15	19	+4
	SC	78	82	+4	47	50	+3	16	20	+4
	SS	85	81	-4*	51	49	-2	14	26	+12*

*Significant difference.

Table B2

Reading/Language Arts Test Performance: 1981-82--Whites Only

Grade in 1981-82		Stratum 1		Stratum 2		Stratum 3	
		80-81	81-82	80-81	81-82	80-81	81-82
2	n	305	305	72	72	5	5
	P_{25}	335	400	294.5	334	248.5	295
	P_{50}	351	428	305	358.5	266	340
	P_{75}	361	466	312	382	287	355.5
3	n	277	277	65	65	7	7
	P_{25}	401.5	65	347	50	281	25
	P_{50}	424	68	358	55	301	32
	P_{75}	460	70	367	60	308	34
4	n	278	278	96	96	13	13
	P_{25}	39	48	31	36	18.5	25.5
	P_{50}	42	53.5	34	42	25	33
	P_{75}	44	57	36	46.75	32.5	36.5
5	n	289	289	134	134	16	16
	P_{25}	50	51	35	39	22.5	26
	P_{50}	53	55	41	45	26	28
	P_{75}	57	58	44	49	28.75	33.25
6	n	282	282	110	110	18	18
	P_{25}	51	52.75	39	40.75	23.75	27
	P_{50}	54	55	43	46	26	31.5
	P_{75}	57	58	45	50	29	37.5
7	n	286	286	138	138	26	26
	P_{25}	51	48	38	35	24	23
	P_{50}	54	53	42	40	29	27
	P_{75}	57	57	45	46	31	33
8	n	270	270	115	115	15	15
	P_{25}	47	50	33	37	23	23
	P_{50}	51	54	38	42	26	27
	P_{75}	56	58	42	47	27	32

Table B3

Mathematics Test Performance: 1981-82--Whites Only

Grade in 1981-82		Stratum 1		Stratum 2		Stratum 3	
		80-81	81-82	80-81	81-82	80-81	81-82
2	n	342	342	40	40	0	0
	P_{25}	342	391	307.25	356.25	N/A	N/A
	P_{50}	365	414	315	371.50	N/A	N/A
	P_{75}	383	433	321	386	N/A	N/A
3	n	317	317	31	31	1	1
	P_{25}	384	66	342	44	N/A	N/A
	P_{50}	409	74	353	51	N/A	N/A
	P_{75}	427	78	357	61	N/A	N/A
4	n	287	287	87	87	13	13
	P_{25}	67	56	46	41	19	24.5
	P_{50}	73	64	54	48	26	32
	P_{75}	79	73	59	53	32	48.5
5	n	268	268	152	152	19	19
	P_{25}	61	65	41.25	43	21	20
	P_{50}	68	72	47	50.5	27	29
	P_{75}	75	77.5	52	57	33	37
6	n	288	288	105	105	17	17
	P_{25}	63	59	41	39	22.5	24.5
	P_{50}	70	66	47	47	27	30
	P_{75}	75	74	52	54	30.5	36.5
7	n	265	265	160	160	23	23
	P_{25}	60	57	39	34	24	20
	P_{50}	66	67	45	41	27	27
	P_{75}	72	75.5	50	49.5	29	33
8	n	262	262	116	116	22	22
	P_{25}	55	59	33	41.25	19	20.75
	P_{50}	63	67	38	48	22	30.5
	P_{75}	71	73	43.75	53	24.25	39

Table B4

Social Studies Test Performance: 1981-82--Whites Only

Grade in 1981-82		Stratum 1		Stratum 2		Stratum 3	
		80-81	81-82	80-81	81-82	80-81	81-82
4	n	280	280	83	83	19	19
	P_{25}	21	26	12	17	8	12
	P_{50}	25	30	15	22	9	14
	P_{75}	29	33	17	25	10	19
5	n	300	300	115	115	22	22
	P_{25}	27	22.25	17	14	8	9.75
	P_{50}	30	26	20	17	9.5	11
	P_{75}	33	30	22	20	13	14.25
6	n	257	257	137	137	17	17
	P_{25}	24	26	15	17	9.5	10
	P_{50}	27	29	18	21	11	12
	P_{75}	29	32	20	24	12	15
7	n	262	262	146	146	31	31
	P_{25}	26	27	17	15	10	10
	P_{50}	29	31	20	19	12	14
	P_{75}	32	35	22	23	12	17
8	n	254	254	127	127	14	14
	P_{25}	28	31	16	18	9.75	10
	P_{50}	32	34	20	23	11	15
	P_{75}	35	37	22	28	12	16

Table B5

Science Test Performance: 1981-82--Whites Only

Grade in 1981-82		Stratum 1		Stratum 2		Stratum 3	
		80-81	81-82	80-81	81-82	80-81	81-82
4	n	281	281	81	81	17	17
	P_{25}	22	27	16	20.5	9.5	15.5
	P_{50}	26	30	18	24	11	20
	P_{75}	29	33	19	26	12	22.5
5	n	305	305	113	113	18	18
	P_{25}	28	21	18	15	10	12.5
	P_{50}	31	24	21	17	12.5	15.5
	P_{75}	33	28	24	20	14.25	18.75
6	n	273	273	120	120	19	19
	P_{25}	22	24	15	17	10	11
	P_{50}	25	28	17	20	11	14
	P_{75}	27	30	18	23	12	19
7	n	291	291	124	124	25	25
	P_{25}	24	23	18	17	11	12
	P_{50}	27	27	19	20.5	11	15
	P_{75}	30	32	21	23	13	17.5
8	n	260	260	119	119	17	17
	P_{25}	25	28	17	18	11	12
	P_{50}	28	32	19	22	12	14
	P_{75}	32	35	22	26	13	17

APPENDIX C: Intermediate Results for Contrast A, Black Students

Table C1

Summary of Contrast A for 1981-82 Data Base: Percentile Ranks for Each Year, Difference, and Significance: Blacks Only

Grade	Subject	Stratum 1 PR1	Stratum 1 PR2	Stratum 1 Diff	Stratum 2 PR1	Stratum 2 PR2	Stratum 2 Diff	Stratum 3 PR1	Stratum 3 PR2	Stratum 3 Diff
2 v 1	RE	79	69	-10*	48	49	+1	20	19	-1
	MA	89	81	-8*	51	62	+11*	21	24	+3
3 v 2	RE	78	68	-10*	44	37	-7*	12	11	-1
	MA	84	71	-13*	43	38	-5	16	21	+5
4 v 3	LA	80	70	-10*	46	42	-4*	12	20	+8*
	MA	77	68	-9*	38	38	0	14	20	+6*
	SC	69	71	+2	46	46	0	17	21	+4
	SS	75	68	-7*	43	44	+1	17	26	+9*
5 v 4	LA	77	72	-5*	42	48	+6*	16	18	+2
	MA	73	76	+3	42	44	+2	17	20	+3
	SC	71	66	-5*	46	36	-10*	14	25	+11*
	SS	71	65	-6*	41	40	-1	18	17	-1
6 v 5	LA	72	76	+4	42	47	+5*	14	18	+4
	MA	75	74	-1	42	45	+3*	17	20	+3
	SC	71	69	-2	41	41	0	11	19	+8*
	SS	69	68	-1	40	42	+2	13	18	+5
7 v 6	LA	76	79	+3	36	43	+7*	13	18	+5
	MA	73	79	+6*	39	46	+7*	12	20	+8*
	SC	69	66	-3	37	42	+5*	15	24	+9*
	SS	71	68	-3	40	38	-2	14	23	+9*
8 v 7	LA	77	81	+4	40	43	+3	16	17	+1
	MA	74	71	-3	40	45	+5*	14	18	+4*
	SC	66	66	0	38	35	-3	16	16	0
	SS	74	73	-1	40	41	+1	14	18	+4

*Significant difference.

Table C2

Reading/Language Arts Test Performance: 1981-82--Blacks Only

Grade in 1981-82		Stratum 1		Stratum 2		Stratum 3	
		80-81	81-82	80-81	81-82	80-81	81-82
2	n	226	266	173	173	35	35
	P_{25}	326	366	293	344.50	247	291
	P_{50}	338	387	303	353	267	314
	P_{75}	351	420	309.5	373.50	298	331
3	n	182	182	151	151	19	19
	P_{25}	384	62	342	46	287	22
	P_{50}	402.5	65	353	53	299	31
	P_{75}	428	68	365	59	312	42
4	n	141	141	170	170	60	60
	P_{25}	39	44	30.75	34	18	20.25
	P_{50}	41	49	34	40	21	27.50
	P_{75}	43	54	36	45	24.75	32.75
5	n	110	110	242	242	74	74
	P_{25}	49	47	35	37	21	23
	P_{50}	51	50	40	42	25	28.5
	P_{75}	53	54.25	43	46	28	35
6	n	104	104	190	190	52	52
	P_{25}	48	49	36	39.75	23	24
	P_{50}	50.5	52	40	44	26	29
	P_{75}	55	55	44	49	29	35.5
7	n	68	68	198	198	69	69
	P_{25}	49	46.25	35	32.75	23	22
	P_{50}	52	49.5	39	37	26	26
	P_{75}	54.75	53.0	43.25	42	29	31
8	n	71	71	166	166	100	100
	P_{25}	46	49	32	35	21	21.25
	P_{50}	49	52	35.5	40	25	28
	P_{75}	53	55	39	44	27	35

Table C3

Mathematics Test Performance: 1981-82--Blacks Only

Grade in 1981-82		Stratum 1		Stratum 2		Stratum 3	
		80-81	81-82	80-81	81-82	80-81	81-82
2	n	328	328	93	93	12	12
	P_{25}	331	367	306.5	341	284	307
	P_{50}	345.5	381	313	363	290.5	331
	P_{75}	365	399	334.5	378.5	308	359.5
3	n	260	260	71	71	21	21
	P_{25}	372.5	59	340	44	309	30
	P_{50}	384	67	348	49	321	37
	P_{75}	403	74	357	56	323	46.5
4	n	155	155	151	151	67	67
	P_{25}	65	54	43	36	26	24
	P_{50}	70	60	49	44	30	31
	P_{75}	75	69	56	50	35	37
5	n	105	105	246	246	76	76
	P_{25}	58	57	40	39	24	24
	P_{50}	62	65	46	47	28.5	30.5
	P_{75}	67.5	72	50	56	32	37
6	n	110	110	185	185	51	51
	P_{25}	58	51.75	40	39	23	24
	P_{50}	64.5	60	46	46	29	31
	P_{75}	72	66	51	51	31	39
7	n	70	70	188	188	76	76
	P_{25}	56	50	38	31	21.25	20
	P_{50}	59.5	59.5	43	38	25	24
	P_{75}	63	66	47.75	45	29.75	29
8	n	79	79	172	172	86	86
	P_{25}	51	56	29.25	38	18	25
	P_{50}	56	61	34	45	21	30
	P_{75}	63	67	39.75	52	23	35.25

Table C4

Social Studies Test Performance: 1981-82--Blacks Only

Grade in 1981-82		Stratum 1		Stratum 2		Stratum 3	
		80-81	81-82	80-81	81-82	80-81	81-82
4	n	137	137	163	163	73	73
	P_{25}	19	22.5	12	15	7	10
	P_{50}	22	26	14	19	9	14
	P_{75}	25.5	30	17	23	10	18
5	n	112	112	239	239	76	76
	P_{25}	25	19	16	13	9.25	9
	P_{50}	27	23	18	16	12	11
	P_{75}	30	26	21	19	12	13
6	n	88	88	199	199	58	58
	P_{25}	22	23	14	15	8	10
	P_{50}	24	26	16	19	10	12
	P_{75}	27	29.75	19	23	11	16
7	n	72	72	174	174	86	86
	P_{25}	25	22	16	13	9	10.75
	P_{50}	26.5	26	18.5	16.5	11	13
	P_{75}	29	31	21	21	12	15
8	n	64	64	183	183	89	89
	P_{25}	25.25	28	14	16	9	10
	P_{50}	28	31.5	17	20	11	13
	P_{75}	34	36	20	24	12	16

Table C5

Science Test Performance: 1981-82--Blacks Only

Grade in 1981-82		Stratum 1		Stratum 2		Stratum 3	
		80-81	81-82	80-81	81-82	80-81	81-82
4	n	138	138	162	162	71	71
	P_{25}	20	22	15	18	8	12
	P_{50}	22	27	17	21	11	15
	P_{75}	26	30	18	24.25	12	18
5	n	105	105	255	255	67	67
	P_{25}	26	16.5	18	13	11	10
	P_{50}	27	21	21	15	13	13
	P_{75}	29	23	23	18	15	15
6	n	84	84	201	201	60	60
	P_{25}	20	21	14	15	9	11.25
	P_{50}	22	24	16	18	10	13
	P_{75}	24	24.75	18	21	12	17
7	n	71	71	176	176	86	86
	P_{25}	22	20	15	15	10	11
	P_{50}	24	24	17	18	12	14
	P_{75}	26	29	19	20.75	13	16
8	n	65	65	191	191	80	80
	P_{25}	23	24	16	15	9	11
	P_{50}	24	27	17	18	12	13
	P_{75}	28	32	20	22	13	16.75

APPENDIX D: Intermediate Results for Contrast B, Total Group

Table D1

Summary of Contrast B for 1982-83 Data Base: Percentile Ranks for Each Year, Difference, and Significance: Total Group

Grade	Sub-ject	Stratum 1 PR1	PR2	Diff	Stratum 2 PR1	PR2	Diff	Stratum 3 PR1	PR2	Diff
2 v 1	RE	82	82	0	48	51	+3	20	34	+14*
	MA	94	89	-5*	52	62	+10*	79	82	+3
3 v 2	RE	86	77	-9*	46	41	-5*	12	15	+3
	MA	92	77	-15*	46	42	-4	14	11	-3
4 v 3	LA	85	77	-8*	50	38	-12*	18	22	-14
	MA	83	76	-7*	44	37	-7*	16	21	+5*
	SC	83	80	-3	46	46	0	17	28	+11*
	SS	82	77	-5*	48	44	-4*	22	26	+4
5 v 4	LA	83	82	-1	42	50	+8*	18	23	+5*
	MA	80	83	+3*	43	45	+2	17	20	+3
	SC	83	75	-8*	46	41	-5*	12	20	+8
	SS	77	73	-4	44	40	-4	14	22	+8*
6 v 5	LA	85	84	-1	45	45	0	14	19	+5
	MA	81	79	-2*	42	41	-1	16	14	-2
	SC	75	78	+3*	41	41	0	16	27	+11*
	SS	77	77	0	44	45	+1	17	26	+9*
7 v 6	LA	84	83	-1	42	46	+4*	18	18	0
	MA	82	81	-1	43	48	+5*	17	19	+2
	SC	78	75	-3*	41	42	+1	15	24	+9*
	SS	77	79	+2*	42	44	+2*	14	18	+4
8 v 7	LA	83	86	+3	43	46	+3	15	19	+4
	MA	83	76	-7*	45	44	-1	15	16	+1
	SC	76	75	-1	42	46	+4	12	21	+9*
	SS	79	80	+1	40	43	+3*	14	26	+12*

*Significant differences.

Table D2

Reading/Language Arts Test Performance: 1982-83 Total Group

Grade in 1982-83		Stratum 1		Stratum 2		Stratum 3	
		81-82	82-83	81-82	82-83	81-82	82-83
2	n	533	533	227	227	34	34
	P_{50}	344	410	303	363	265.5	337.5
3	n	507	507	212	212	37	37
	P_{50}	418	67	355.5	55	299	36
4	n	532	532	205	205	47	47
	P_{50}	42	51	35	38	24	29
5	n	402	402	273	273	62	62
	P_{50}	53	53	40	43	26	31
6	n	444	444	332	332	63	63
	P_{50}	54	54	41	43	26	30
7	n	469	469	254	254	49	49
	P_{50}	54	51	42	38	29	26
8	n	407	407	284	284	86	86
	P_{50}	51	54	37	41	24.5	29

Table D3

Mathematics Test Performance: 1982-83 Total Group

Grade in 1982-83		Stratum 1		Stratum 2		Stratum 3	
		81-82	82-83	81-82	82-83	81-82	82-83
2	n	678	678	108	108	8	8
	P_{50}	356	393	314	363	335.5	382
3	n	653	653	73	73	28	28
	P_{50}	399	70	350	51	318	27.5
4	n	520	520	212	212	53	53
	P_{50}	73	64	52	43	32	32
5	n	376	376	307	307	56	56
	P_{50}	66	69	47	48	29	30.5
6	n	443	443	322	322	74	74
	P_{50}	68	63	46	44	28	27
7	n	412	412	291	291	70	70
	P_{50}	65	62	45	39	29	23.5
8	n	400	400	306	306	70	70
	P_{50}	63	65	37	44.5	21.5	29

Table D4

Social Studies Test Performance: 1982-83--Total Group

Grade in 1982-83		Stratum 1		Stratum 2		Stratum 3	
		81-82	82-83	81-82	82-83	81-82	82-83
4	n	492	492	209	209	77	77
	P_{50}	25	29	15	19	10	14
5	n	417	417	267	267	55	55
	P_{50}	29	25	19	16	11	12
6	n	384	384	343	343	117	117
	P_{50}	26	28	17	20	11	14
7	n	388	388	313	313	71	71
	P_{50}	28	30	19	18	11	12
8	n	350	350	336	336	84	84
	P_{50}	30	33.5	17	21	11	15

Table D5

Science Test Performance: 1982-83--Total Groups

Grade in 1982-83		Stratum 1		Stratum 2		Stratum 3	
		81-82	82-83	81-82	82-83	81-82	82-83
4	n	458	458	207	207	69	69
	P_{50}	26	29	17	21	18	17
5	n	413	413	264	264	62	62
	P_{50}	30	23	21	16	12.5	12
6	n	422	422	331	331	91	91
	P_{50}	23	26	16	18	11	15
7	n	404	404	303	303	65	65
	P_{50}	26	27	18	18	12	14
8	n	352	352	344	344	74	74
	P_{50}	27.5	30	18	21	11	14.5

APPENDIX E: Intermediate Results for Contrast B, White Students

Table E1

Summary of Contrast B for 1982-83 Data Base: Percentile Ranks for Each Year, Difference, and Significance: White Group

Grade	Subject	Stratum 1 PR1	Stratum 1 PR2	Stratum 1 Diff	Stratum 2 PR1	Stratum 2 PR2	Stratum 2 Diff	Stratum 3 PR1	Stratum 3 PR2	Stratum 3 Diff
2 v 1	RE	86	89	+3	48	54	+6	41	40	-1
	MA	97	94	-3	51	85	+34*	55	69	-14
3 v 2	RE	90	81	-9*	48	43	-5	14	19	+5
	MA	97	83	-14*	53	48	-5	21	21	0
4 v 3	LA	90	86	-4*	50	42	-8*	17	20	+3
	MA	85	80	-5*	50	35	-15*	16	16	0
	SC	86	87	+1	46	54	+8*	17	24	+7
	SS	87	85	-2	43	48	+5	22	20	-2
5 v 4	LA	86	85	-1	47	50	+3*	22	28	+6
	MA	82	85	+3	45	49	+4*	18	24	+6
	SC	87	79	-8*	50	47	-3	14	28	+14*
	SS	81	77	-4	48	40	-8*	16	17	+1
6 v 5	LA	88	87	-1	48	57	+9*	17	29	+12*
	MA	86	84	-2*	44	43	-1	10	14	+4
	SC	79	82	+3*	41	51	+10*	16	32	+16*
	SS	81	81	0	44	48	+4*	17	29	+12*
7 v 6	LA	87	85	-2	45	51	+6*	21	23	+2
	MA	85	84	-1	43	53	+10*	17	26	+9*
	SC	82	78	-4	46	47	+1	15	33	+18*
	SS	81	82	+1	45	47	+2	16	23	+7
8 v 7	LA	88	87	-1	46	49	+3	26	17	-9*
	MA	85	79	-6*	45	45	0	13	20	+7
	SC	78	79	+1	47	50	+3	20	27	+7
	SS	82	81	-1	44	47	+3*	10	22	+12*

*Significant difference.

Table E2

Reading/Language Arts Test Performance: 1982-83 Whites Only

Grade in 1982-83		Stratum 1		Stratum 2		Stratum 3	
		81-82	82-83	81-82	82-83	81-82	82-83
2	n	307	307	56	56	8	8
	P_{50}	351	426	303	367	295.5	346.5
3	n	312	312	52	52	8	8
	P_{50}	430	68	357.5	56	302	40
4	n	302	302	54	54	12	12
	P_{50}	43	54	35	40	23.5	28
5	n	266	266	104	104	13	13
	P_{50}	54	54	42	43	29	34
6	n	304	304	112	112	14	14
	P_{50}	55	55	42	47	27.5	36
7	n	322	322	90	90	16	16
	P_{50}	55	52	43	40	31	28.5
8	n	306	306	118	118	22	22
	P_{50}	53	54	38	42	29.5	28

Table E3

Mathematics Test Performance: 1982-83 Whites Only

Grade in 1982-83		Stratum 1		Stratum 2		Stratum 3	
		81-82	82-83	81-82	82-83	81-82	82-83
2	n	349	349	19	19	3	3
	P_{50}	365	405	313	386	316	369
3	n	351	351	18	18	3	3
	P_{50}	414	73	355.5	54.5	328	37
4	n	303	303	56	56	9	9
	P_{50}	74	66	55.5	41.5	32	28
5	n	246	246	126	126	12	12
	P_{50}	67	70	48	50	30	33.5
6	n	300	300	113	113	18	18
	P_{50}	71	66	47	45	23.5	27
7	n	292	292	115	115	21	21
	P_{50}	67	64	45	42	29	27
8	n	299	299	135	135	12	12
	P_{50}	65	67	37	45	20.5	31.5

Table E4

Social Studies Test Performance: 1982-83--Whites Only

Grade in 1982-83		Stratum 1		Stratum 2		Stratum 3	
		81-82	82-83	81-82	82-83	81-82	82-83
4	n	289	289	61	61	16	16
	P_{50}	27	31	14	20	10	12.5
5	n	277	277	94	94	14	14
	P_{50}	30	26	20	16	11.5	11
6	n	280	280	125	125	31	31
	P_{50}	27	29	17	21	11	15
7	n	287	287	123	123	20	20
	P_{50}	29	31	20	19	11.5	13
8	n	274	274	150	150	19	19
	P_{50}	31	34	18	22.5	10	14

Table E5

Science Test Performance: 1982-83--Whites Only

Grade in 1982-83		Stratum 1		Stratum 2		Stratum 3	
		81-82	82-83	81-82	82-83	81-82	82-83
4	n	270	270	60	60	13	13
	P_{50}	27	31	17	23	11	16
5	n	282	282	89	89	14	14
	P_{50}	31	24	22	17	13	13.5
6	n	306	306	115	115	15	15
	P_{50}	24	27	16	20	11	16
7	n	301	301	111	111	15	15
	P_{50}	27	28	19	19	12	16
8	n	282	282	150	150	11	11
	P_{50}	28	31	19	22	13	16

APPENDIX F: Intermediate Results for Contrast B, Black Students

Table F1

Summary of Contrast B for 1982-83 Data Base: Percentile Ranks for Each Year, Difference, and Significance: Black Group

Grade	Subject	Stratum 1 PR1	Stratum 1 PR2	Stratum 1 Diff	Stratum 2 PR1	Stratum 2 PR2	Stratum 2 Diff	Stratum 3 PR1	Stratum 3 PR2	Stratum 3 Diff
2 v 1	RE	79	71	-8*	47	50	+3	18	24	+6
	MA	92	84	-8*	54	56	+2	90	84	-6
3 v 2	RE	67	65	-2	46	41	-5*	12	11	-1
	MA	82	66	-16*	44	40	-4	14	10	-4
4 v 3	LA	80	70	-10*	50	36	-14*	18	22	+4
	MA	79	67	-12*	42	37	-5*	16	21	+5
	SC	77	67	-10*	46	46	0	17	28	+11*
	SS	78	68	-10*	48	44	-4*	22	26	+4
5 v 4	LA	73	72	-1	40	48	+8*	18	19	+1
	MA	76	80	+4*	42	44	+2	17	19	+2
	SC	76	62	-14*	41	41	0	11	20	+9*
	SS	71	65	-6*	44	40	-4	14	22	+8*
6 v 5	LA	75	74	-1	42	42	0	13	18	+5
	MA	73	72	-1	40	39	-1	17	14	-3
	SC	66	66	0	41	41	0	16	27	+11*
	SS	73	68	-5	44	42	-2	17	22	+5
7 v 6	LA	76	71	-5*	40	41	+1	16	16	0
	MA	75	74	-1	43	46	+3*	16	18	+2
	SC	74	66	-8*	37	42	+5*	15	20	+5
	SS	73	68	-5	42	44	-2	14	18	+4
8 v 7	LA	74	71	-3	41	43	+2	14	18	+4
	MA	75	68	-7*	45	43	-2	15	16	+1
	SC	69	73	+4	42	46	+4	12	20	+8*
	SS	72	72	0	40	41	+1	14	26	+12*

*Significant difference.

Table F2

Reading/Language Arts Test Performance: 1982-83 Blacks Only

Grade in 1982-83		Stratum 1		Stratum 2		Stratum 3	
		81-82	82-83	81-82	82-83	81-82	82-83
2	n	223	223	171	171	25	25
	P_{50}	328	391	302	361	263	322
3	n	193	193	160	160	29	29
	P_{50}	386	64	355	55	299	32
4	n	228	228	151	151	35	35
	P_{50}	41	49	35	37	24	29
5	n	133	133	169	169	49	49
	P_{50}	50	50	39	42	26	29
6	n	140	140	219	219	49	49
	P_{50}	51	51.5	40	42	25	29
7	n	147	147	164	164	33	33
	P_{50}	52	47	41	36	28	25
8	n	101	101	166	166	64	64
	P_{50}	48	49	36	40	24	28.5

Table F3

Mathematics Test Performance: 1982-83 Blacks Only

Grade in 1982-83		Stratum 1		Stratum 2		Stratum 3	
		81-82	82-83	81-82	82-83	81-82	82-83
2	n	326	326	88	88	5	5
	P_{50}	351	385	315	358	347	385
3	n	300	300	55	55	25	25
	P_{50}	382	64	349	50	318	27
4	n	215	215	156	156	44	44
	P_{50}	71	59	51	43	32	32
5	n	127	127	181	181	44	44
	P_{50}	64	67	46	47	29	30
6	n	143	143	208	208	56	56
	P_{50}	63	59	45	43	29	27
7	n	120	120	176	176	49	49
	P_{50}	61	56	45	38	28	23
8	n	101	101	171	171	58	58
	P_{50}	57	59	37	44	22	29

Table F4

Social Studies Test Performance: 1982-83--Blacks Only

Grade in 1982-83		Stratum 1		Stratum 2		Stratum 3	
		81-82	82-83	81-82	82-83	81-82	82-83
4	n	201	201	148	148	61	61
	P_{50}	23	26	15	19	10	14
5	n	137	137	173	173	41	41
	P_{50}	27	23	19	16	11	12
6	n	104	194	218	218	85	85
	P_{50}	25	26	17	19	11	13
7	n	101	101	190	190	51	51
	P_{50}	27	26	19	17	11	12
8	n	76	76	186	186	65	65
	P_{50}	27.5	31	17	20	11	15

Table F5

Science Test Performance: 1982-83--Blacks Only

Grade in 1982-83		Stratum 1		Stratum 2		Stratum 3	
		81-82	82-83	81-82	82-83	81-82	82-83
4	n	186	186	147	147	56	56
	P_{50}	24	26	17	21	11	17
5	n	128	128	175	175	48	48
	P_{50}	28	20	20	16	12	12
6	n	116	116	215	215	76	76
	P_{50}	21	23.5	16	18	11	15
7	n	103	103	189	189	50	50
	P_{50}	25	24	17	18	12	13
8	n	70	70	194	194	63	63
	P_{50}	25	29	18	21	11	14

APPENDIX G: Intermediate Results for Contrast C, Total Group

Table G1-1

Contrast C for Seven Strata Sequences, 1981-83 Data Base: Median, Associated National Percentile Ranks and Differences: Total Group-Reading/Language Arts

		Grade 3			Grade 4			Grade 5		
		Pre	Post	Diff	Pre	Post	Diff	Pre	Post	Diff
Seq 1	n	409	409		382	382		318	318	
	P_{50}	348	68		422	57		42	54	
	PR	85	81	-4*	88	70	-18*	85	85	0
Seq 2	n	111	111		102	102		162	162	
	P_{50}	303	54		353	31.5		34	42	
	PR	48	39	-9*	44	30	-14*	46	48	+2
Seq 3	n	14	14		12	12		31	31	
	P_{50}	264.5	33.5		299	17		19	26	
	PR	19	13	-6	12	7	-5	9	14	+5
Seq 4	n	82	82		33	33		66	66	
	P_{50}	327	57		386	39		40	46	
	PR	70	46	-24*	68	41	-27*	74	59	-15*
Seq 6	n	17	17		17	17		24	24	
	P_{50}	296	39		338	23		31	33.5	
	PR	41	17	-24*	34	18	-16*	36	27	-9*
Seq 7	n	59	59		66	66		52	52	
	P_{50}	310	63		364	38		36	48	
	PR	54	62	+8	52	61	+9*	54	66	+12*
Seq 9	n	17	17		9	9		24	24	
	P_{50}	289	44		N/A	N/A		24.5	37	
	PR	35	23	-12				19	35	+16*

*Significant differences.

Table G1-2

Contrast C for Seven Strata Sequences, 1981-83 Data Base: Median, Associated National Percentile Ranks and Differences: Total Group--Reading/Language Arts

		Grade 6			Grade 7			Grade 8		
		Pre	Post	Diff	Pre	Post	Diff	Pre	Post	Diff
Seq 1	n	319	319		336	336		299	299	
	P_{50}	53	55		54	52		54	54	
	PR	83	87	+4*	85	85	0	84	87	+3*
Seq 2	n	228	228		172	172		200	200	
	P_{50}	40	43		40	38		40	40.5	
	PR	42	45	+3*	42	46	+4*	38	45	+7*
Seq 3	n	40	40		28	28		50	50	
	P_{50}	25	25.7		24	24.5		27	27	
	PR	16	15	-1	11	15	+4	14	16	+2
Seq 4	n	47	47		26	26		33	33	
	P_{50}	49	47		48.5	44		50	45	
	PR	70	57	-13*	68	62	-6*	68	58	-10*
Seq 6	n	17	17		13	13		28	28	
	P_{50}	33	36		36	31		34.5	34	
	PR	29	29	0	32	29	-3	27	28	+1
Seq 7	n	93	93		97	97		77	77	
	P_{50}	43	49		44	45		45	48	
	PR	50	64	+14*	53	65	+12*	51	68	+17*
Seq 9	n	34	34		30	30		29	29	
	P_{50}	27	35		28.5	30.5		27	33	
	PR	19	27	+8*	18	28	+10*	14	26	+12*

*Significant difference.

Table G2-1

Contrast C for Seven Strata Sequences, 1981-83 Data Base: Median, Associated National Percentile Ranks and Differences: Total Group-Mathematics

		Grade 3 Pre	Grade 3 Post	Grade 3 Diff	Grade 4 Pre	Grade 4 Post	Grade 4 Diff	Grade 5 Pre	Grade 5 Post	Grade 5 Diff
Seq 1	n	544	544		420	420		313	313	
	P_{50}	359	71		402	65		74	70	
	PR	95	79	-16*	93	78	-15*	85	85	0
Seq 2	M	25	25		60	60		167	167	
	P_{50}	312	49		349	40		51	46	
	PR	49	38	-11	44	32	-12*	42	42	0
Seq 3	M	5	5		10	10		30	30	
	P_{50}	N/A	N/A		313.5	25		27.5	26	
	PR				11	12	+1	11	13	+2
Seq 4	M	53	53		95	95		83	83	
	P_{50}	335	58		376	44		67	55	
	PR	80	55	-25*	77	38	-39*	71	58	-13*
Seq 6	M	16	16		12	12		18	18	
	P_{50}	305	29.5		334.5	28.5		42	36	
	PR	39	13	-26*	28	17	-11	28	27	-1
Seq 7	M	60	60		12	12		25	25	
	P_{50}	318	605		355.5	52		56	61	
	PR	58	60	+2	53	53	0	51	69	+18*
Seq 9	M	3	3		5	5		29	29	
	P_{50}	N/A	N/A		N/A	N/A		31	39	
	PR							15	31	+16*

*Significant differences.

Table G2-2

Contrast C for Seven Strata Sequences, 1981-83 Data Base: Median, Associated National Percentile Ranks and Differences: Total Group-Mathematics

		Grade 6			Grade 7			Grade 8		
		Pre	Post	Diff	Pre	Post	Diff	Pre	Post	Diff
Seq 1	n	313	313		322	322		286	286	
	P_{50}	67	67		70	63		65	68	
	PR	82	85	+3*	85	83	-2*	82	81	-1
Seq 2	n	232	232		191	191		218	218	
	P_{50}	45.5	44		46	39		425	45	
	PR	41	41	0	42	48	+6*	38	45	+7*
Seq 3	n	43	43		36	36		44	44	
	P_{50}	27	25		27.5	21.5		25	27	
	PR	14	12	-2	16	15	-1	12	13	+1
Seq 4	n	33	33		53	53		29	29	
	P_{50}	58	53		59	47		56	53	
	PR	64	59	-5*	65	60	-5*	65	59	-6*
Seq 6	n	25	25		25	25		20	20	
	P_{50}	36	33		39	26		35	35	
	PR	26	23	-3	31	24	-7*	26	27	+1
Seq 7	n	98	98		55	55		78	78	
	P_{50}	50	52		52	48		50	52	
	PR	48	57	+9*	52	62	+10*	53	57	+4*
Seq 9	n	36	36		21	21		36	36	
	P_{50}	31	37		31	30		26.5	35	
	PR	20	29	+9*	20	32	+12*	14	27	+13*

*Significant differences.

Table G3

Contrast C for Seven Strata Sequences, 1981-83 Data Base: Medians Associated National Percentile Ranks and Differences: Total Group--Science

		Grade 5			Grade 6			Grade 7			Grade 8		
		Pre	Post	Diff	Pre	Post	Diff	Pre	Post	Diff	Pre	Post	Diff
Seq 1	n	73	73		312	312		290	290		263	263	
	P_{50}	26	22		31	27		25	31		27	31	
	PR	86	71	-15*	87	82	-5*	83	78	-5*	82	79	-3*
Seq 2	n	42	42		209	209		198	198		193	193	
	P_{50}	18	16		21	18		16	18		18	21	
	PR	51	41	-10*	46	41	-5*	41	42	+1	41	46	+5*
Seq 3	n	6	6		35	35		27	27		43	43	
	P_{50}	N/A	N/A		13	14		10	13		11	14	
	PR				14	23	+9*	11	20	+9*	11	20	+9*
Seq 4	n	27	27		63	63		46	46		71	71	
	P_{50}	21	16		27	22		21	21.5		23	25	
	PR	65	41	-24*	71	60	-11*	66	57	-9*	65	60	-5*
Seq 6	n	7	7		45	45		24	24		22	22	
	P_{50}	N/A	N/A		18	16		14	14.5		16	16	
	PR				33	32	-1	31	27	-4	32	27	-5
Seq 7	n	26	26		74	74		80	80		57	57	
	P_{50}	18	17		23	22		17	22		20	27	
	PR	51	47	-4	54	60	+6	47	59	+12*	51	66	+15*
Seq 9	n	10	10		39	39		35	35		53	53	
	P_{50}	12.5	18		13	16		11	15		12	16	
	PR	24	18	+28*	14	32	+18	16	29	+13*	15	27	+12*

*Significant difference.

Table G4

Contrast C for Seven Strata Sequences, 1981-83 Data Base: Medians Associated National Percentile Ranks and Differences: Total Group--Social Studies

		Grade 5			Grade 6			Grade 7			Grade 8		
		Pre	Post	Diff	Pre	Post	Diff	Pre	Post	Diff	Pre	Post	Diff
Seq 1	n	90	90		297	297		282	282		263	263	
	P_{50}	25	25		30	29		26.5	31		29	34	
	PR	82	73	-9	81	81	0	79	82	+3*	81	81	0
Seq 2	n	46	46		224	224		202	202		199	199	
	P_{50}	16	15.5		19	19		16	18		19	21	
	PR	53	38	-15*	44	42	-2	40	44	+4*	42	43	+1
Seq 3	n	7	7		53	53		29	29		44	44	
	P_{50}	N/A	N/A		11	12		10	12		10	13.5	
	PR				14	18	+4	13	18	+5	10	20	+10*
Seq 4	n	22	22		77	77		43	43		49	19	
	P_{50}	21	19		26	23		22	23		26	26	
	PR	71	51	-20*	68	56	-12*	61	59	-2	68	57	-11*
Seq 6	n	7	7		46	46		32	32		31	31	
	P_{50}	N/A	N/A		17.5	15		14	13		16	17	
	PR				39	29	-10*	32	23	-9*	33	32	-1
Seq 7	n	11	11		53	53		70	70		57	57	
	P_{50}	17	19		22	23		20	23.5		22	29	
	PR	57	51	-6	55	56	+1	54	61	+7*	52	66	+14*
Seq 9	n	12	12		28	28		32	32		59	43	
	P_{50}	12	16		12	15		11	14		12	17	
	PR	32	40	+8	18	29	+11*	17	28	+11*	18	32	+14*

*Significant difference.

APPENDIX H: Intermediate Results for Contrast C, White Students

Table H1-1

Contrast C for Seven Strata Sequences, 1981-83 Data Base: Median, Associa
National Percentile Ranks and Differences: Whites-Reading

		Grade 3			Grade 4			Grade 5		
		Pre	Post	Diff	Pre	Post	Diff	Pre	Post	Diff
Seq 1	n	265	265		238	238		224	224	
	P_{50}	355	69		428	60		42	55	
	PR	88	86	-2	90	77	-13*	85	88	+3*
Seq 2	n	31	31		29	29		57	57	
	P_{50}	305	54		357	34		33	42	
	PR	50	39	-11	47	33	-14*	42	48	+6
Seq 3	n	N/A	N/A		3	3		4	4	
	P_{50}	N/A	N/A		N/A	N/A		N/A	N/A	
	PR									
Seq 4	n	18	18		12	12		29	29	
	P_{50}	327	59		397	39		40	46	
	PR	70	50	-20*	75	41	-34*	74	59	-15*
Seq 6	n	5	5		7	7		8	8	
	P_{50}	N/A	N/A		N/A	N/A		N/A	N/A	
	PR									
Seq 7	n	21	21		19	19		22	22	
	P_{50}	310	64		368	40		36.5	50	
	PR	54	65	+11	55	42	-13	57	72	+15*
Seq 9	n	4	4		N/A	N/A		8	8	
	P_{50}	N/A	N/A		N/A	N/A		N/A	N/A	
	PR									

* Significant

Table M1-2
Contrast C for Seven Strata Sequences, 1981-83 Data Base: Median, Associated National Percentile Ranks and Differences: Whites-Reading

		Grade 6			Grade 7			Grade 8		
		Pre	Post	Diff	Pre	Post	Diff	Pre	Post	Diff
Seq 1	n	239	239		256	256		246	246	
	P_{50}	54	55		54	53		55	55	
	PR	86	87	+1	85	88	+3	87	90	+3*
Seq 2	n	73	73		59	59		79	79	
	P_{50}	40	46		40	40		42	40	
	PR	42	54	+12*	42	51	+9*	42	43	+1
Seq 3	n	6	6		7	7		11	11	
	P_{50}	N/A	N/A		N/A	N/A		29	28	
	PR							18	17	-1
Seq 4	n	22	22		12	12		21	21	
	P_{50}	48.5	49		51	44.5		50	44	
	PR	68	64	-4	75	64	-11*	68	55	-13*
Seq 6	n	5	5		4	4		7	7	
	P_{50}	N/A	N/A		N/A	N/A		N/A	N/A	
	PR									
Seq 7	n	42	42		43	43		37	37	
	P_{50}	43	48.5		45	47		45	49	
	PR	50	62	+12*	56	71	+15*	51	71	+20*
Seq 9	n	8	8		8	8		11	11	
	P_{50}	N/A	N/A		N/A	N/A		30	35	
	PR							19	31	+12*

* Significant

Table H2-1
Contrast C for Seven Strata Sequences, 1981-83 Data Base: Median, Associated National Percentile Ranks and Differences: Whites-Mathematics

		Grade 3			Grade 4			Grade 5		
		Pre	Post	Diff	Pre	Post	Diff	Pre	Post	Diff
Seq 1	n	303	303		252	252		215	215	
	P_{50}	365	74		411	66		75	71	
	PR	97	85	-12*	96	80	-16	87	86	-1
Seq 2	n	9	9		16	16		63	63	
	P_{50}	N/A	N/A		353	36		54	46	
	PR				49	26	-23	47	42	-5*
Seq 3	n	N/A	N/A		N/A	N/A		6	6	
	P_{50}	N/A	N/A		N/A	N/A		N/A	N/A	
	PR									
Seq 4	n	13	13		30	30		45	45	
	P_{50}	340	62		384	47.5		67	57	
	PR	85	63	-22*	84	44	-40*	71	62	-9*
Seq 6	n	N/A	N/A		2	2		2	2	
	P_{50}	N/A	N/A		N/A	N/A		N/A	N/A	
	PR									
Seq 7	n	19	19		5	5		13	13	
	P_{50}	318	63		N/A	N/A		56	61	
	PR	58	65	+7				51	69	+18*
Seq 9	n	N/A	N/A		N/A	N/A		6	6	
	P_{50}	N/A	N/A		N/A	N/A		N/A	N/A	
	PR									

* significant

Table H2-2
Contrast C for Seven Strata Sequences, 1981-83 Data Base: Median, Associated National Percentile Ranks and Differences: Whites-Mathematics

		Grade 6			Grade 7			Grade 8		
		Pre	Post	Diff	Pre	Post	Diff	Pre	Post	Diff
Seq 1	n	235	235		246	246		229	229	
	P_{50}	69	68		70	65		67	70	
	PR	85	87	+2*	85	85	0	85	83	-2*
Seq 2	n	87	87		68	68		93	93	
	P_{50}	46	44		46	42		43	43	
	PR	42	41	-1	42	53	+11*	39	41	+2
Seq 3	n	9	9		9	9		6	6	
	P_{50}	N/A	N/A		N/A	N/A		N/A	N/A	
	PR									
Seq 4	n	10	10		27	27		20	20	
	P_{50}	57	55		61	51		55.5	53.5	
	PR	63	64	+1	69	67	-2	65	60	-5
Seq 6	n	6	6		9	9		5	5	
	P_{50}	N/A	N/A		N/A	N/A		N/A	N/A	
	PR									
Seq 7	n	41	41		25	25		46	46	
	P_{50}	50	52		52	49		49.5	52	
	PR	48	57	+9*	52	64	+12*	52	57	+5*
Seq 9	n	7	7		6	6		11	11	
	P_{50}	N/A	N/A		N/A	N/A		28	35	
	PR							16	27	+11*

* significant

Table H3
Contrast C for Seven Strata Sequences, 1981-83 Data Base: Medians Associated National Percentile Ranks and Differences: White Group--Science

		Grade 5			Grade 6			Grade 7			Grade 8		
		Pre	Post	Diff	Pre	Post	Diff	Pre	Post	Diff	Pre	Post	Diff
Seq 1	n	49	49		245	245		232	232		22	222	
	P_{50}	29	23		31	28		25	29		28	32	
	PR	92	72	-17*	87	86	-1	83	81	-2*	86	82	-4*
Seq 2	n	9	9		63	63		67	67		73	73	
	P_{50}	N/A	N/A		20	19		16	19		19	21	
	PR				41	46	+5*	41	47	+6*	46	46	0
Seq 3	n	N/A	N/A		5	5		5	5		8	8	
	P_{50}	N/A	N/A		N/A	N/A		N/A	N/A		N/A	N/A	
	PR												
Seq 4	n	11	11		33	33		26	26		48	48	
	P_{50}	22	16		27	22		21	22.5		23	25	
	PR	69	41	-28*	71	60	-11*	66	61	-5	65	60	-5
Seq 6	n	N/A	N/A		7	7		6	6		1	1	
	P_{50}	N/A	N/A		N/A	N/A		N/A	N/A		N/A	N/A	
	PR				33	32	-1	31	27	-4	32	27	-5
Seq 7	n	11	11		30	30		44	44		36	36	
	P_{50}	19	18		22.5	23		17	22.5		20	27	
	PR	56	52	-4	52	65	+13*	47	61	+14*	51	66	+15*
Seq 9	n	10	10		10	10		10	10		15	15	
	P_{50}	12.5	18		12	15.5		12	15.5		12	17	
	PR	24	18	+28*	11	30	+19*	20	31	+11*	15	31	+16*

*Significant difference.

Table H4

Contrast C for Seven Strata Sequences, 1981-83 Data Base: Medians Associated National Percentile Ranks and Differences: White Group--Social Studies

		Grade 5			Grade 6			Grade 7			Grade 8		
		Pre	Post	Diff	Pre	Post	Diff	Pre	Post	Diff	Pre	Post	Diff
Seq 1	n	55	55		230	203		221	221		215	214	
	P_{50}	27	27		31	29		27	32		29	35	
	PR	87	81	-6	81	85	-4*	81	85	+4*	81	85	+4*
Seq 2	n	12	12		69	69		76	76		87	87	
	P_{50}	14	14		19	20		17	18.5		20	23	
	PR	43	32	-11*	44	45	+1	44	46	+2	45	49	+4*
Seq 3	n	2	2		12	12		7	7		12	12	
	P_{50}	N/A	N/A		9	12		N/A	N/A		10.5	13.5	
	PR				8	18	+10				12	20	+8
Seq 4	n	7	7		43	43		25	25		30	30	
	P_{50}	N/A	N/A		26	24		24	23		26	25	
	PR				68	60	-8*	69	59	-10*	68	54	-14*
Seq 6	n	2	2		12	12		10	10		6	6	
	P_{50}	N/A	N/A		18.5	19		14	13		N/A	N/A	
	PR				43	42	-1	32	23	-9			
Seq 7	n	4	4		24	24		40	40		37	37	
	P_{50}	N/A	N/A		21	22		20	24		22	29	
	PR				54	62	+8*	54	62	+8*	52	66	+14*
Seq 9	n	N/A	N/A		5	5		6	6		16	16	
	P_{50}	N/A	N/A		N/A	N/A		N/A	N/A		12	18	
	PR										18	35	+17*

*Significant difference.

APPENDIX I: Intermediate Results for Contrast C, Black Students

Table I1-1

Contrast C for Seven Strata Sequences, 1981-83 Data Base: Medians, Associated National Percentile Ranks and Differences: Black Group--Reading

		Reading+ Grade 3			Reading++ Grade 4			L/A Grade 5		
		Pre	Post	Diff	Pre	Post	Diff	Pre	Post	Diff
Seq 1	n	142	142		143	143		92	92	
	P_{50}	341	65.5		415	52		41	53	
	PR	81	70	-11*	85	61	-24*	82	80	+2*
Seq 2	n	80	80		73	73		105	105	
	P_{50}	303	53		350	31		34	41	
	PR	48	37	-11*	42	29	-13*	46	45	-1
Seq 3	n	13	13		9	9		27	27	
	P_{50}	263	31		N/A	N/A		19	25	
	PR	18	11	-7				9	13	+4
Seq 4	n	64	64		21	21		37	37	
	P_{50}	327	57		382	39		40	46	
	PR	70	46	-24*	65	41	-24*	74	59	-15*
Seq 6	n	12	12		12	12		16	16	
	P_{50}	295	37.5		332	25		31	33	
	PR	40	16	-24*	30	21	-9	36	26	-10
Seq 7	n	38	38		47	47		30	30	
	P_{50}	309.5	62.5		364	37		35.5	48	
	PR	54	60	+6	52	38	-14*	52	66	+14*
Seq 9	n	13	13		8	8		16	16	
	P_{50}	289	44		N/A	N/A		24	37	
	PR	35	23	-12				18	35	+17*

+Note: Reading--Grade 1 vs Grade 3

++Note: Reading--Grade 2 vs Grade 4

* Significant

Table I1-2

Contrast C for Seven Strata Sequences, 1981-83 Data Base: Medians, Associated National Percentile Ranks and Differences: Black Group--Reading

		Grade 6			Grade 7			Grade 8		
		Pre	Post	Diff	Pre	Post	Diff	Pre	Post	Diff
Seq 1	n	80	80		80	80		53	53	
	P_{50}	52	53		52.5	51		53	53	
	PR	80	80	0	81	83	+2	80	84	+4
Seq 2	n	155	155		113	113		121	121	
	P_{50}	39	42		39	36		39	41	
	PR	40	42	+2	39	41	+2	36	46	+10
Seq 3	n	34	34		21	21		39	39	
	P_{50}	25	27		24	24		26	27	
	PR	16	14	-2	11	14	+3	13	16	+3
Seq 4	n	25	25		14	14		12	12	
	P_{50}	49	46		47	42.5		49.5	45	
	PR	70	54	-16*	62	58	-4	66	58	-8
Seq 6	n	12	12		9	9		21	21	
	P_{50}	32	35.5		N/A	N/A		34	34	
	PR	27	28	+1				26	28	+2
Seq 7	n	51	51		54	54		40	40	
	P_{50}	42	49		44	43		45	47	
	PR	47	64	+17*	53	59	+6*	51	64	+13*
Seq 9	n	26	26		22	22		18	18	
	P_{50}	27	35		28	31.5		26	31.5	
	PR	19	27	+8*	17	30	+13*	13	24	+11*

* Significant

Table I2-1

Contrast C for Seven Strata Sequences, 1981-83 Data Base: Medians, Associated National Percentile Ranks and Differences: Black Group--Mathematics

		Grade 3			Grade 4			Grade 5		
		Pre	Post	Diff	Pre	Post	Diff	Pre	Post	Diff
Seq 1	n	239	239		167	167		106	109	
	P_{50}	351	66		393	61		71.5	67	
	PR	92	69	-23*	89	70	-19*	80	80	0
Seq 2	n	16	16		44	44		104	104	
	P_{50}	310	49		348	41.5		49	46	
	PR	46	38	-8	43	35	-8	38	42	+4
Seq 3	n	5	5		9	9		24	24	
	P_{50}	N/A	N/A		N/A	N/A		27.5	27	
	PR							11	15	+4
Seq 4	n	40	40		65	65		38	38	
	P_{50}	333	56.5		37.5	43		66.5	52.5	
	PR	78	52	-26*	76	37	-39*	70	54	-16*
Seq 6	n	14	14		10	10		16	16	
	P_{50}	305	29		338	30.5		41.5	35	
	PR	39	13	-26*	31	19	-12	27	26	-1
Seq 7	n	41	41		7	7		12	12	
	P_{50}	318	60		N/A	N/A		55	61.5	
	PR	58	59	+1				49	70	+21*
Seq 9	n	3	3		5	5		23	23	
	P_{50}	N/A	N/A		N/A	N/A		33	39	
	PR							17	31	+14*

* significant

Table I2-2

Contrast C for Seven Strata Sequences, 1981-83 Data Base: Medians, Associated National Percentile Ranks and Differences: Black Group--Mathematics

		Grade 6			Grade 7			Grade 8		
		Pre	Post	Diff	Pre	Post	Diff	Pre	Post	Diff Signif
Seq 1	n	78	78		76	76		57	57	
	P_{50}	63	62.5		68	58		61	64	
	PR	74	78	+4*	81	77	-4	75	75	0
Seq 2	n	145	145		123	123		125	125	
	P_{50}	45	43		46	38		42	45	
	PR	40	39	-1	42	46	+4*	37	45	+8*
Seq 3	n	34	34		27	27		38	38	
	P_{50}	27	25.5		28	20		24.5	27	
	PR	14	13	-1	16	12	-4	11	13	+2
Seq 4	n	23	23		26	26		9	9	
	P_{50}	59	53		57.5	45.5		N/A	N/A	
	PR	67	59	-8*	63	58	-5*			
Seq 6	n	19	19		16	16		15	15	
	P_{50}	36	30		40	25		36	35	
	PR	26	19	-7*	33	22	-11*	27	27	0
Seq 7	n	57	57		30	30		32	32	
	P_{50}	50	52		51	47.5		50	52	
	PR	48	57	+9*	51	61	+10*	53	57	+4
Seq 9	n	29	29		15	15		25	25	
	P_{50}	31	37		30	30		26	35	
	PR	20	29	+9*	19	32	+13*	13	27	+14*

* significant

Table I3

Contrast C for Seven Strata Sequences, 1981-83 Data Base: Medians, Associated National Percentile Ranks and Differences: Black Group--Science

		Grade 5			Grade 6			Grade 7			Grade 8		
		Pre	Post	Diff	Pre	Post	Diff	Pre	Post	Diff	Pre	Post	Diff
Seq 1	n	24	24		67	67		58	58		41	41	
	P_{50}	23	19		28	25		22	25		25	29	
	PR	73	57	-16*	76	74	-2	71	69	-2	74	73	-1
Seq 2	n	33	33		146	146		131	131		120	120	
	P_{50}	18	16		21	18		15	18		17	17	
	PR	51	41	-10*	46	41	-5*	36	42	+6*	37	46	+9*
Seq 3	n	5	5		30	30		22	22		35	35	
	P_{50}	N/A	N/A		13	15		10	13		12	14	
	PR				14	27	+13*	11	20	+9	15	20	+5
Seq 4	n	16	16		30	30		20	20		23	23	
	P_{50}	21	16		27	21		21.5	20.5		24	24	
	PR	65	41	-24*	71	55	-16*	69	53	-16*	69	57	-12*
Seq 6	n	6	6		38	38		18	18		21	21	
	P_{50}	N/A	N/A		18	15.5		13.5	14		16	16	
	PR				33	30	-3	28	24	-4	32	27	-5
Seq 7	n	15	15		44	44		36	36		21	21	
	P_{50}	18	17		23	21		18	22		19	26	
	PR	51	47	-4	54	55	+1	52	59	+7*	46	63	+17*
Seq 9	n	8	8		29	29		25	25		38	38	
	P_{50}	N/A	N/A		13	16		10	15		12	16	
	PR				14	32	+18*	11	29	+18*	15	27	+12*

* significant

Table I4

Contrast C for Seven Strata Sequences, 1981-83 Data Base: Medians, Associated National Percentile Ranks and Differences:Black Group-Social Studies

		Grade 5			Grade 6			Grade 7			Grade 8		
		Pre	Post	Diff	Pre	Post	Diff	Pre	Post	Diff	Pre	Post	Diff
Seq 1	n	35	35		67	67		61	61		48	48	
	P_{50}	24	23		28	27		25	21		27	32.5	
	PR	80	65	-15*	74	73	-1	73	53	-20*	73	77	+4
Seq 2	n	34	34		155	155		126	126		112	112	
	P_{50}	16.5	16		19	19		16	18		19	21	
	PR	55	40	-15*	44	42	-2	40	44	+4*	42	43	+1
Seq 3	n	5	5		41	41		22	22		32	32	
	P_{50}	N/A	N/A		12	12		9.5	11		10	13.5	
	PR				18	18	0	11	14	+3	10	20	+10*
Seq 4	n	15	15		34	34		18	18		19	19	
	P_{50}	19	17		25.5	22.5		22	21.5		26	26	
	PR	65	44	-21*	67	54	-13*	61	55	-6	68	57	-11*
Seq 6	n	5	5		34	34		22	22		25	25	
	P_{50}	N/A	N/A		17	14.5		13.5	13.5		16	17	
	PR				37	28	-9*	30	26	-4	33	32	-1
Seq 7	n	7	7		29	29		30	30		20	20	
	P_{50}	N/A	N/A		22	23		19.5	23		21	29.5	
	PR				55	56	+1	53	59	+6	48	68	+20*
Seq 9	n	11	11		23	23		26	26		43	43	
	P_{50}	12	15		12	14		11	14		11	16	
	PR	32	36	+4	18	26	+8*	17	29	+11*	14	29	+15*

* significant

Footnotes

[1]The 24 data files constructed for students assigned to low-ability or teaching groups would be composed as follows: One file each for second-grade students assigned to low-level reading groups and low-level mathematics groups; two additional files for students similarly assigned in grade 3; one file each for fourth-grade students assigned to low-level language arts, mathematics, science, and social studies groups; sixteen additional files for students similarly assigned in grades 5 through 8.

References

Abramson, D. A. (1959). The effectiveness of grouping for students of high ability. Educational Research Bulletin, 38, 169-182.

Bail, F. W. (1973). The relationship between elementary and middle school organizational properties and the scores of sixth grade classrooms as measured by an instrument of educational process. Dissertation Abstracts, 34(4), 1508-A.

Barlow, I. H. (1962). Does homogeneous grouping give homogeneous groups? The Elementary School Journal, 63, 28-32.

Barthelmess. H. M., & Boyer, P. A. (1932). An evaluation of ability grouping. Journal of Educational Research, 26, 284-294.

Berkum, M., Swanson, L. W., & Sawyer, D. M. (1966). An experiment on homogeneous grouping for reading in elementary classes. Journal of Educational Research, 59 (9), 413-414.

Borg, W. R., & Prpich, T. (1966). Grouping of slow learning high school pupils. Journal of Secondary Education, 41 (5), 231-238.

Breidenstine, A. B. (1936). The educational achievement of pupils in differentiated and undifferentiated groups. Journal of Experimental Education, 5, 91-127.

Douglas, J. F. (1973). A study of streaming at a grammar school. Educationsal Research, 15 (2), 140-143.

Johnson, M., & Scriven, E. Class size and achievement gains in seventh- and eighth-grade English and mathematics. The School Review, 75 (3), 300-310.

Millman, J., & Mauritz, J. Jr. (1964). Relation of section variance to achievement gains in English and mathematics in grades seven and eight. American Educational Research Journal, 1 (1), 47-51.

Mobley, C. F. (1976). A comparison of the effects of multiage grouping vs. homogeneous age grouping in primary school classes of reading and matehmatics achievement (Practicum Report). (Eric Document Reproduction Service No. ED 128-102.)

Piland J. C., & Lemke, E. A. (1971). The effect of ability grouping on concept learning. Journal of Educational Research, 64 (5), 209-212.

Siegel, S. (1956). Non-parametric statistics. New York: McGraw-Hill.

Thompson, G. W. (1974). The effects of ability grouping upon achievement in eleventh grade American history. Journal of Experimental Education, 42(4), 76-79.

Wardrop, J. L., Cooke, D. M., Quilling, M., & Klausmeier, H. J.. (1967). Research and development activities in research and instruction units of two elementary schools of Manitowoc, Wisconsin, 1966-1967. Madison, Wisconsin: Wisconsin University, Research and Development Center for Cognitive Learning. (ERIC Document Reproduction Service No. 019 796)

Williams, M. H. (1973). Does ability grouping affect motivation? The Elementary School Journal, 73, 130-137.